New Hampshire Department of Environmental Services

RESPONSE TO PUBLIC COMMENT
AND
SUMMARY OF SUBSTANTIVE DIFFERENCES BETWEEN THE DRAFT AND FINAL 2012 SECTION 303 (D) SURFACE WATER QUALITY REPORT

July 19th, 2013

On April 20, 2012, the New Hampshire Department of Environmental Services (DES) released the draft Section 303(d) List of impaired waters for public comment. Downloadable copies of the draft list were made available on the DES website for review (http://des.nh.gov/organization/divisions/water/wmb/swqa/index.htm). In addition, the following organizations/agencies were notified by email:

Appalachian Mountain Club
Audubon Society
Center for Biological Diversity
Connecticut River Joint Commissions
Conservation Law Foundation
County Conservation Districts
Great Bay Municipal Coalition
Lake and River Local Management Advisory Committees
Maine Department of Environmental Protection
Manchester Conservation Commission
Massachusetts Department of Environmental Protection
Merrimack River Watershed Council
National Park Service
New England Interstate Water Pollution Control Commission
NH Department of Health and Human Services
NH Coastal Program
NH Rivers Council
North Country Council
Regional Planning Commissions
Society for the Protection of National Forests
Natural Resources Conservation Service
The Nature Conservancy
Upper Merrimack River Local Advisory Committee
US Environmental Protection Agency
US Geological Survey
US Fish and Wildlife Service
US Forest Service
University of New Hampshire
Vermont Department of Environmental Conservation
Volunteer Lakes Assessment Program
Volunteer Rivers Assessment Program
Water Quality Standards Advisory Committee

The public comment period was originally schedule to end on May 21, 2012. However, the comment period was extended to July 5, 2012 to accommodate requests for more time. Five comment letters were received by the deadline. Two additional letters were received after the deadline, but were still addressed. The public comment letters received are listed on Table 1.

The following sections contain the comments received, DES's responses to comments, and supporting information. The sections are organized as follows:

A. Response to Public Comment (Note: This section contains DES's responses to all of the comments received. The responses are organized by reference number. A reference number refers to a specific section of a comment letter in Section C.)

B. Summary of Substantive Differences Between the Draft and Final 2012 Section 303(d) List

C. Public Comment on the Draft 2012 Section 303(d) List (Note: This section contains the full text of all comments received. Each individual comment in the letters has been assigned a reference number. The responses in Section A are organized by reference number.)

D. References

Table 1. Comment Letters Received By NHDES with Designated Comment Letter Number

COMMENTER	RECEIVED	COMMENT #
Eric Swope, Industrial Pretreatment Coordinator, City of Keene	May 17, 2012	1
Dr. Arthur C. Mathieson, Professor of Plant Biology, Jackson Estuarine Laboratory & Department of Biological Sciences	May 21, 2012	2
Tom Irwin Esq., Vice President & NH-Director, Conservation Law Foundation	June 26, 2012	3
David Green, Chief Operator WWTF, City of Rochester	July 2, 2012	4
Dean Peschel, Great Bay Municipal Coalition	July 2, 2012	5
Dean Peschel, Great Bay Municipal Coalition	Oct 18, 2012	6
Dean Peschel, Great Bay Municipal Coalition	Nov 2, 2012	7

A. RESPONSE TO PUBLIC COMMENT

COMMENT # 1: Eric Swope, Industrial Pretreatment Coordinator, City of Keene

Comment reference: **1- 1**, **1- 2**, **1- 3**, **1- 4**, **1- 5**, **1- 6**, **1- 7**, **1- 8**
The River section NHRIV802010301-11 should be desisted for the impairment of Aquatic Life due to low Dissolved Oxygen Saturation based upon the improved effluent from the Keene WWTF and the resulting improved conditions of the Ashuelot River as demonstrated during the 2010 sampling under low-flow conditions.

***DES RESPONSE* to** 1- 1, 1- 2, 1- 3, 1- 4, 1- 5, 1- 6, 1- 7, & 1- 8*:*

The original impairment is based on Dissolved Oxygen Saturation exceedences at;

- 16M-ASH ~1.2 miles Upstream of the Keene WWTF – Exceedences in 2001 & 2002.
- 16D-ASH ~ 100 feet Upstream of the Keene WWTF – Exceedences in 2001 & 2002.
- 16B-ASH ~ 800 feet Downstream of the Keene WWTF – Exceedences in 2001, 2002, & 2007.

Most rivers have a break in the assessment units where they pass a WWTF. The Ashuelot River (NHRIV802010301-11) is a rare exception to that rule. In recognition of the differences in water quality expected upstream to downstream of the Keene WWTF, the 'Ashuelot River – Otter Brook to South Branch' (NHRIV802010301-11) (2.605 miles) was split at the point of discharge from the Keene WWTF resulting in,

- NHRIV802010301-11, Ashuelot River – Otter Brook to Keene WWTF (2.3849 miles)
- NHRIV802010301-38, Ashuelot River – Keene WWTF to South Branch (0.2261 miles)

Based upon the new break, the new data, and the modified operations of the Keene WWTF the Dissolved Oxygen Saturation Impairment for the Final 2012 303(d),

- Will remain on NHRIV802010301-11, Ashuelot River – Otter Brook to Keene WWTF, due to the non-resampled condition at 16M-ASH
- Has been removed from NHRIV802010301-38, Ashuelot River – Keene WWTF to South Branch due to the modified operations of the Keene WWTF and the new water quality data collected at low flow.

The full data review is provided in the "2012 Delisting" document, 'Impairments Removed (i.e. Delisted) from the 303(d) List of Threatened or Impaired Waters'.

COMMENT #2: Dr. Arthur C. Mathieson, Professor of Plant Biology, Jackson Estuarine Laboratory & Department of Biological Sciences

DES RESPONSE **to 2- 1**

The commenter argues that “based upon … observations and scientific data, eutrophication is creating an unstable and negative situation within the GBES [Great Bay Estuarine System], which needs to be quickly rectified.” This comment supports DES’s recommendation to include many assessment units in the Great Bay Estuary on the 303d list for eutrophication-related parameters.

COMMENT #3: Tom Irwin Esq., Vice President & NH-Director, Conservation Law Foundation

***DES RESPONSE* to 3- 1**

The commenter supports the proposed impairments in the Great Bay Estuary for eutrophication parameters. The commenter provides supporting information in the form of exhibits, including a favorable review of the DES 2009 Report (DES, 2009) by Dr. Ivan Valiela and Dr. Erin Kinney of Woods Hole Environmental Associates.

COMMENT #4: David Green, Chief Operator WWTF, City of Rochester

DES RESPONSE **to 4- 1, 4- 5, and 4- 6**
These comments cover the same issues (and use nearly the same wording) as **5- 88** and **5- 89**. See the responses to those comments.

The commenter cites 40 CFR 130.6 as the federal regulation governing impairment determinations. The correct citations are 40 CFR 130.7 and 130.10. See response to **7- 1** showing that DES is fully compliant with the applicable federal regulations.

DES RESPONSE **to 4- 2 and 4- 3**
See the responses to comments **5- 84** and **5- 85**.

DES RESPONSE **to 4- 4**
The commenter is incorrect in stating that the numeric thresholds from the DES 2009 Report were developed without data from the Cocheco River. Figure 27 of that report shows the relationship between dissolved oxygen and chlorophyll-a (DES, 2009). Data from station NH-0058A, which is in the Cocheco River, is included on this graph as well as others.

COMMENT # 5: Dean Peschel, Great Bay Municipal Coalition (GBMC)

DES RESPONSE **to 5- 1 through 5- 4**

These sections are part of a cover letter that summarizes, in general terms, the arguments that are made in greater detail in the attachment to the letter. The responses to sections **5- 11** through **5- 87** address the issues raised in these sections.

DES RESPONSE **to 5- 5**

This section summarizes, in general terms, the requested change to the 303(d) list of impaired waters that is made in greater detail in the attachment to the letter. The response to section **5- 88** addresses the issue raised in this section.

DES RESPONSE **to 5- 6**

The commenter requested "removal all nitrogen-caused transparency exceedences related to eelgrass." The same commenter posed essentially the same questions to DES during the public comment period on the 2012 Consolidated Assessment and Listing Methodology. DES responded to these comments on April 20, 2012 (DES, 2012b at 8 and 14). The DES response is reproduced below.

> *"The impairments for light attenuation ("transparency/TN-based listings") cannot be deleted from the 303(d) list because light attenuation is a good indicator of eelgrass survival and there is a statistically significant relationship between light attenuation and total nitrogen in the estuary. The Great Bay Municipal Coalition has argued that light attenuation is naturally occurring and unrelated to nitrogen, especially in the tidal rivers. In the N.H. Surface Water Quality Regulations, "naturally occurring" means conditions which exist in the absence of human influences (Env-Wq 1702.29). Figure 2a shows that light attenuation and total nitrogen have statistically significant relationships in the estuary, including in the tidal rivers (Figure 2b). Total nitrogen concentrations are a strong indicator of human influence. Therefore, given the relationship between light attenuation and total nitrogen in the estuary, including in the tidal rivers, it cannot be justified that light attenuation is "naturally occurring" nor can it be justified that light attenuation is unrelated to nitrogen concentrations.*
>
> *"Explanation:*
> *"There are multiple ways that excess nitrogen impacts eelgrass in the Great Bay Estuary. First, like all plants, eelgrass needs light to survive. Increasing nitrogen concentrations cause algae blooms (Figure 3) and elevated primary productivity in general. The plant matter floating in the water shades the eelgrass plants so they do not get enough light to survive. Figure 4 shows that light attenuation in the Great Bay Estuary is more strongly correlated with plant/organic matter in the water than any other factor. Second, excess nitrogen creates an environment in which epiphytes can grow on the leaves of eelgrass and macroalgae can out-compete and smother eelgrass. Field studies in Nettleton et al. (2011) and Pe'eri et al. (2008) have demonstrated that macroalgae has increased,*

dramatically in some places, as nitrogen has increased in the estuary. Finally, excess nitrogen disrupts cellular processes for eelgrass (Burkholder et al., 2007).

"The dominant mechanism by which nitrogen affects eelgrass is different in different parts of the Great Bay Estuary and can vary over time. Light attenuation, a general measure of water clarity, is a good indicator of the presence or absence of eelgrass especially in the deeper areas of the estuary. Subtidal eelgrass beds in these areas need clear water to transmit light to the growing depths. In shallower areas, overgrowth and smothering by macroalgae and/or cellular disruption may be the immediate cause of eelgrass loss. However, even in shallow areas, light attenuation is still an important contributing factor for eelgrass viability because sufficient light is a requirement for plant survival in all areas.

"Eelgrass may be impacted by other factors such as sediments, dredging, and disease. However, the strong relationships between nitrogen, light attenuation and algae growth demonstrate that nitrogen is most likely the dominant cause of, and certainly contributes significantly to, eelgrass losses in the Great Bay Estuary. Figure 5 shows that light attenuation increases with increasing nitrogen concentrations in the Great Bay Estuary, even accounting for changes in salinity. The same robust relationship is evident between total nitrogen and algae growth (chlorophyll-a) (Figure 3). These figures show that the relationships are robust, not merely correlations due to salinity differences. The strong relationships between nitrogen and chlorophyll-a and light attenuation are not surprising because these factors are well established indicators of eutrophication, which is caused by excess nutrients." (DES, 2012b)

DES RESPONSE **to 5- 7, 5- 8, and 5- 9**

These sections summarize, in general terms, the requested changes to the 303(d) list of impaired waters that are made in greater detail in the attachment to the letter. The responses to sections **5- 91**and **5- 92** address the issues raised in these sections.

DES RESPONSE **to 5- 10**

This section is a salutation. No response needed.

DES RESPONSE **to 5- 11**

This section is an introduction. No response needed.

DES RESPONSE **to 5- 12, 5- 13, 5- 14**

This section contains information on laws, regulations, and court decisions regarding the 303(d) listing process. There are no comments on the NH 2012 303(d) List. No response is needed.

DES RESPONSE **to 5- 15, 5- 16, and 5- 17**

In this section, the commenter cites the federal regulations and guidance for establishing state water quality criteria (40 CFR 131.11). However, these rules and guidance are not relevant to the process for compiling NH's 2012 303(d) List. The state water quality criteria relevant to nutrients in the Great Bay Estuary are Env-Wq 1703.07 (Dissolved Oxygen), Env-Wq 1703.14 (Nutrients), and Env-Wq 1703.18 (Biological and Aquatic Community Integrity). All of these criteria have been correctly promulgated by the State and approved by EPA as required under the Clean Water Act.

The commenter claims that the document titled *Using Field Data and Weight of Evidence to Develop Water Quality Criteria* by Cormier et al. (2008) is EPA guidance on the "weight of evidence" approach. The article was written by EPA employees. However, the article was not published by EPA and contains a disclaimer at the end stating: "This paper has been reviewed and cleared for publication, but it does not necessarily reflect the policies of the Agency."

The commenter also included an incorrect reference to the EPA's *Nutrient Criteria Technical Guidance Manual – Rivers and Streams* (EPA, 2000). The comments provided pertain to estuarine waters. Therefore, guidance documents related to rivers and streams are not relevant. The correct EPA guidance document would be *Nutrient Criteria Technical Guidance Manual – Estuaries and Marine Coastal Waters* (EPA, 2001).

DES RESPONSE **to 5- 18 and 5- 41**

In these two sections, the commenter argues that the existing narrative standard for nutrients requires that a demonstration of causation. The actual narrative standard for nutrients reads:

> *Env-Wq 1703.14 Nutrients.*
> *(a) Class A waters shall contain no phosphorus or nitrogen unless naturally occurring.*
> *(b) Class B waters shall contain no phosphorus or nitrogen in such concentrations that would impair any existing or designated uses, unless naturally occurring.*
> *(c) Existing discharges containing either phosphorus or nitrogen which encourage cultural eutrophication shall be treated to remove phosphorus or nitrogen to ensure attainment and maintenance of water quality standards.*
> *(d) There shall be no new or increased discharge of phosphorus into lakes or ponds.*
> *(e) There shall be no new or increased discharge(s) containing phosphorus or nitrogen to tributaries of lakes or ponds that would contribute to cultural eutrophication or growth of weeds or algae in such lakes and ponds*.

Sections (b), (c), and (e) show that the relevant threshold is not a "demonstration of a cause and effect relationship" suggested by the commenter. The term cause is not used in the narrative criteria. In fact, the wording of Env-Wq 1703.14 explicitly states that nutrient levels in the water body only have to "encourage" or "contribute to" cultural eutrophication to prompt action in Class B waters.

In **5- 41**, the commenter argues that DES "historically required the demonstration of a cause and effect relationship" when interpreting Env-Wq 1703.14. This is not true. DES has always used a weight-of-evidence approach so that all available information is appropriately considered. Compliance with narrative criteria is determined based on a preponderance of the evidence.

The commenter also implies that the values published by DES in a report titled "Numeric Nutrient Criteria for the Great Bay Estuary" (DES, 2009) are un-adopted state water quality standards. This is not true. In fact, the report is a DES guidance document that describes the basis for certain thresholds that are used by DES, through a stressor-response decision matrix, to apply New Hampshire's water quality standards to the available data about the Great Bay Estuary in the context of preparing the 303(d) List. These thresholds guide DES's decision as to whether the narrative nutrient criteria were or were not being attained for a specific assessment unit within the Great Bay Estuary. Contrary to claim of the commenter, the use of a stressor-response matrix ensures that both nutrient concentrations and impairments of designated uses are considered in the assessment.

Finally, the commenter's claim that DES blindly assumes that all loss of eelgrass is due to nutrients is false. In the Consolidated Assessment and Listing Methodology, the protocol for assessing eelgrass loss explicitly requires a review of non-nutrient factors, such as dredging, in areas with significant eelgrass loss. (DES, 2012d at 58).

<u>DES RESPONSE</u> **to 5- 19**

In sections **5- 20** through **5- 40**, the commenter makes nine claims based on information from the depositions of Dr. Fred Short of the University of New Hampshire, Paul Currier formerly of DES, and Philip Trowbridge of DES. DES has prepared a response to each of the nine claims in the following paragraphs. Where possible, DES has also responded to correct obviously erroneous conclusions from the depositional testimony. However, it not always possible to respond because the deposition citations were vague and often misleading.

<u>DES RESPONSE</u> **to 5- 20, 5- 21, and 5- 22**

The commenter claims that there is uncertainty about the why eelgrass populations are changing. In fact, DES has relied on its analysis of the long-term data and possible confounding factors, coupled with accepted hypotheses of the relationships between nutrients and their effects, to state with reasonable scientific certainty that anthropogenic nitrogen has caused or contributed to the observed decline in eelgrass in the Great Bay Estuary. See also the response to **5- 6**.

One of the supporting statements relied upon by the commenter claims that: "On Piscataqua River, eelgrass were first declining (2003-2007) where water quality was the best (Harbor mouth) and moved to upstream areas. Why this occurred is unknown. (see Short dep.)". This statement is not supported by the data. Eelgrass was completely absent in the Upper Piscataqua River in 2007, while there were still 201.3 acres of eelgrass in Portsmouth Harbor. This pattern is consistent with observations of poorer water quality in the Piscataqua River compared to Portsmouth Harbor. The commenter's claim that eelgrass was able to survive under pre-2000 conditions is unsupported and can be explained by a delayed response of eelgrass to stresses.

<u>DES RESPONSE</u> **to 5- 23**

The commenter claims that water quality in the Great Bay is not limited by transparency. DES interprets this claim as meaning that the clarity of the water is not the major limiting factor for eelgrass survival. DES agrees that one of the reasons why eelgrass still exists in Great Bay proper is the exposure of eelgrass plants to direct sunlight during low tide. However, water clarity is not the only way in which nitrogen affects eelgrass (see response to **5- 24** through **5- 29**). Therefore, the claim that Great Bay proper is not transparency limited does not mean that nitrogen does not affect eelgrass in the Great Bay proper. See also the response to **5- 6**.

DES RESPONSE to **5- 24 through 5- 29**

The commenter claims that "nitrogen increases have not caused excessive plant growth or any change in transparency adversely impacting eelgrass".

Based on the depositions cited, DES interprets this claim to refer specifically to phytoplankton, which is one of many types of algae. Similarly, location is not defined in the claim but interpreted to mean Great Bay proper because that is the only place for which phytoplankton records extend back to 1980. With those definitions, it is correct that there have been no clear trends in chlorophyll-a (a specific measurement of phytoplankton) measured in Great Bay over the full period of record from 1974 to 2011 in Great Bay (PREP, 2013 at 16). However, the statement ignores the fact that phytoplankton are not the only form of algae that is important in a shallow estuary like the Great Bay. For shallow systems, it is expected that changes in macroalgae will precede changes in phytoplankton (McGlathery et al., 2007; Valiela et al., 1997), which is what is actually happening in Great Bay. At the mouth of Lubberland Creek in Great Bay, macroalgae increased from 0.8 to 39.3 percent cover between 1980 and 2010 (PREP, 2013 at 16).

GBMC has previously acknowledged that macroalgae has increased in the estuary. In a letter from Dean Peschel to Harry Stewart on November 14, 2011, the GBMC stated that "Great Bay waters (excluding the tidal rivers) should be identified as impaired due to excessive macroalgae growth, and the parameter of concern causing the impairment should be identified as DIN." (Peschel, 2011 at 3)

Accordingly, the claim is only theoretically accurate if it is read as pertaining solely to phytoplankton and not to all types of algae, including some that may be more significant.

The commenter's claim that eelgrass "thrived" under high nutrient concentrations is unsupported and can explained by a delayed response of eelgrass to stresses. The transparency data in Great Bay cited by the commenter was from one near-shore location that did not necessarily reflect conditions in the whole bay. Finally, the conclusions of the study by Morrison et al. (2008) regarding light attenuation factors, such as colored dissolved organic matter, were only applicable to deep areas of the estuary and did not consider all of the mechanisms by which eelgrass can be affected by nutrients (e.g., macroalgae, as discussed above).

See also the responses to **5- 6** and **5- 23**.

DES RESPONSE **to 5- 30 and 5- 31**

The commenter claims that "narrative criteria violations not demonstrated". This comment has already been addressed. See response to **5- 18**.

DES RESPONSE **to 5- 32**
The commenter claims that "application of 2009 numeric criteria in tidal rivers unsupported". DES interprets this claim as specifically pertaining to the question of whether reducing nitrogen concentrations in the tidal rivers will allow for eelgrass re-establishment. DES does not dispute that colored dissolved organic matter (CDOM) and turbidity are important factors related to water clarity in the tidal rivers. However, eelgrass was mapped in significant quantities in the tidal rivers in 1948 (DES, 2012 at 14). Average CDOM levels in the tidal rivers are not expected to have changed over time. Therefore, if naturally occurring CDOM and turbidity were the only factors controlling transparency (and presumably eelgrass survival) in the rivers, it would not have been possible for eelgrass to have existed in these areas at any point in history.

The commenter's claim that eelgrass restoration in the tidal rivers will be unsuccessful is predicated on the assumption that the only way that nitrogen affects eelgrass is through phytoplankton blooms that cause shading. In fact, there are several other ways that excess nitrogen can affect eelgrass. In response to similar comments from the GBMC on the 2012 Consolidated Assessment and Listing Methodology, DES showed that total nitrogen accounts for 27% of the variability in light attenuation in the tidal rivers. See also the response to **5- 6**).

It must also be recognized that eelgrass has been present in New Hampshire's tidal rivers in recent times. The fact that eelgrass has been detected in the tidal portions of the Winnicut, Lamprey, Oyster, Bellamy, and Upper Piscataqua Rivers in recent years (i.e., since 1981 when the first modern comprehensive mapping was conducted) demonstrates that it should be possible to restore eelgrass in these areas (DES, 2012 at 14).

DES RESPONSE to **5- 33 and 5- 34**
The commenter claims that there is uncertainty about the cause of macroalgae growth. However, comments provided by Dr. Art Mathieson of the University of New Hampshire (see Comment #2 reproduced in part below) clearly link increases in macroalgae blooms to increased nutrients.

> *"Prior to the 1980s no major algal blooms were apparent and the nutrient levels were much lower than today (cf. Mathieson and Hehre, 1981). During the past 2-3 decades the following macroalgal patterns have occurred along with increased nutrients:*
>
> - *"Extensive ulvoid green algae (Ulva spp.) or "green tides" (Fletcher, 1996) have begun to dominate many of these estuarine areas during the past 15-20 years, particularly within Great Bay proper (Nettleton et al. 2011). Such massive blooms of foliose green algae can entangle, smother and cause the death of eelgrass (Zostera marina) within the low intertidal/shallow subtidal zones (pers. obs. A C Mathieson). They primarily represent annual populations that can also regenerate from residual fragments buried in muddy habitats.*
> - *"Extensive epiphytic growths of seaweeds on eelgrass (Zostera marina) have also occurred during the past 15-20 years, particularly within Great Bay proper (pers. obs. A C Mathieson). These epiphytes, which are mostly*

> *filamentous red algae and colonial diatoms, may completely cover the fronds of eelgrass, limiting the host's growth and photosynthesis and compromising its viability.*" (see comment **2- 1**)

Another part of the comment was about the location of macroalgae relative to eelgrass. Macroalgae is not a rooted plant. The locations where it has washed up on shore do not necessarily reflect the locations where it is present in the estuary.

DES RESPONSE **to 5- 35 and 5- 36**
The commenter claims that "eelgrass restoration occurring under existing conditions". DES interprets this claim to refer specifically to eelgrass in Little Bay because both supporting statements refer to Little Bay. The eelgrass data for Little Bay were recently reviewed by the PREP Technical Advisory Committee for the 2013 State of Our Estuaries report. The recent data were summarized in the following way.

> *"The new eelgrass bed in Little Bay may be a positive sign. Starting in 1996, eelgrass has declined in this area over time and was essentially absent from 2007 through 2010. However, in 2011, a 48-acre eelgrass bed was observed in this area. The large variance in eelgrass cover in this area shows the variability of eelgrass recovery. Data from 2012 and future years are needed to determine if this bed will persist showing an improving trend in Little Bay."* (PREP, 2013 at 20)

Therefore, based on the available data, it is premature to conclude that "eelgrass restoration is occurring under existing conditions" in Little Bay specifically. The data for the Great Bay Estuary as a whole continue to show decreasing trends for eelgrass habitat (PREP, 2013 at 20).

DES RESPONSE **to 5- 37**
The DES 2009 Report (DES, 2009) is a DES guidance document that describes the basis for certain thresholds that are used by DES, through a stressor-response decision matrix, to apply New Hampshire's water quality standards to the available data about the Great Bay Estuary in the context of preparing the 303(d) list. These thresholds guide DES's decision as to whether the narrative nutrient criteria were or were not being attained for a specific assessment unit within the Great Bay Estuary. See also the response to **5- 42** and **5- 43**.

This comment refers to decisions made for the 2008 303d list, not the 2012 303d list. The only comments that DES received relative to nitrogen for the 2008 303d list were from the Conservation Law Foundation. These comments argued for adding nutrient impairments in the Great Bay Estuary. In order to be responsive to these comments, DES developed methodologies for nutrient assessments that were vetted through an extensive public participation process before being implemented.

DES RESPONSE **to 5- 38 and 5- 39**
The comment repeats claims from **5- 46**, **5- 84**, and **5- 85**. See responses to those sections.

DES RESPONSE **to 5- 40**

This is a summary statement based on sections **5- 20** through **5- 39**. See the responses to these sections.

DES RESPONSE **to 5- 41**

This statement is a repeat of comment **5- 18**. See response to comment **5- 18**.

DES RESPONSE **to 5- 42 and 5- 43**

The proposed numeric thresholds are neither new nor revised water quality standards, so the alleged significance of the Alaska Rule is misplaced. The DES 2009 Report (DES, 2009) is a non-binding, site-specific analysis. It is not a new water quality standard.

DES RESPONSE to **5- 44**

The nitrogen thresholds developed in the DES 2009 Report (DES, 2009) were peer reviewed by two independent experts from Cornell University and the University of Maryland. Both reviewers found the thresholds to be reasonable and well-supported by the data presented. The claims that the thresholds in the report were based on erroneous technical assumptions are unfounded.

The commenter misrepresents the final guidance issued by EPA's Science Advisory Board, which stated:

> *"the final [Guidance] document should emphasize that statistical associations may not be biologically relevant and do not prove cause and effect. However, when properly determined, statistical associations can be very useful in supporting a cause and effect argument as part of a weight-of-evidence approach to criteria development."* (SAB, 2010 at 2, emphasis added).

DES has relied on its analysis of the long-term data and possible confounding factors, coupled with accepted hypotheses of the relationships between nutrients and their effects, to state with reasonable scientific certainty that anthropogenic nitrogen has caused or contributed to the observations of cultural eutrophication in the Great Bay Estuary. Therefore, the approach used by DES has been entirely consistent with the EPA guidance.

DES RESPONSE **to 5- 45**

The 303d assessments were, in fact, based entirely on site-specific data from each of the assessment units in the estuary and all data provided by GBMC by the deadline for the 2012 assessments were included in the analysis. Even the GBMC's Squamscott River Study report (HydroQual, 2012), which was submitted after the deadline, was considered by DES when performing the assessments. The comment regarding transparency and nitrogen reductions has already been addressed. See responses to comments **5- 6**, **5- 23**, and **5- 24** through **5- 29**.

DES RESPONSE **to 5- 46**

Most of this comment is a repeat of claims from comment **5- 44**. See response to that comment. The two new issues raised are responded to below.

The commenter's claim that the report by Jones (2007) "confirmed that nitrogen is not the cause of the impairments EPA is intending to address" is not an accurate representation of the report. The Jones (2007) report actually concludes with the following statement which is far from confirming that nitrogen is not the cause of the impairments:

> *"Despite being a consistently significant source of nutrients to the river, DO conditions at the outfall pipe were never below target levels. However, the oxygen demanding processes that are stimulated by nutrients may not take place immediately at the outfall pipe. Thus, the widespread low DO levels on 8/19/05 downstream of the WWTF may have been caused by discharged nutrients, as well as the more confined low DO levels observed on 8/5/05. The elevated chlorophyll a levels observed downstream of the Exeter WWTF on two dates also supports this scenario."* (Jones, 2007 at 37)

The commenter also claims that it is not scientifically defensible for DES to plot data from areas with different physical and chemical conditions. DES has already responded to this comment. On April 20, 2012, DES provided graphs showing that light attenuation increases with increasing nitrogen concentrations in the Great Bay Estuary, even accounting for changes in salinity. The same robust relationship is evident between total nitrogen and algae growth (chlorophyll-a). These graphs were provided in response to comments on the Consolidated Assessment and Listing Methodology (DES, 2012b at 9).

DES RESPONSE **to 5- 47**

The comment repeats claims that changes in salinity explain the relationships between nutrients and eutrophication parameters in the DES 2009 report. DES has already demonstrated that the relationships are still evident even after controlling for salinity (DES, 2012b at 8). See response to **5- 46**.

DES RESPONSE **to 5- 48 and 5- 49 through 5- 57**

In **5- 48**, the commenter claims that an EPA internal analysis confirmed scientific deficiencies in the DES 2009 Report. Sections **5- 49** through **5- 57** are not actually comments. They are selected quotes from the EPA internal analysis.

The selected quotes used by the commenter misrepresent the overall conclusions of the EPA memorandum.

Reading the EPA memorandum, it is clear that the objectives of the EPA analysis were to answer the following questions:

- Was a reasonable conceptual model described to explain functional relationships and established based on both literature and site-specific data or models?
- Were confounding variables eliminated as potential explanations of observed relationships?
- Was the level of uncertainty evaluated?

(EPA, 2010b at 2)

The EPA report concluded that, "Overall, the document meets these conditions, but could be improved in some areas. Below I make some suggestions of additional data or analyses that could be emphasized to improve the confidence of the stressor-response relationships described in the NH DES criteria document." (EPA, 2010b at 2) Many statements in the EPA report were complimentary of DES's report. For example, "Page 55 has a nice summary of the conceptual model of eutrophication and light extinction that affects eelgrass. And, the model for light extinction is corroborated by the data on the presence and absence of eelgrass in the estuary. In areas of more light extinction, there is less eelgrass. So, this is corroboration of the model, but also a good example of a weight of evidence approach." (EPA, 2010b at 3)

Finally, as stated in response to comment **5- 44**, the nitrogen thresholds developed in the DES 2009 Report were peer reviewed by two independent experts from Cornell University and the University of Maryland. Both reviewers found the thresholds to be reasonable and well-supported by the data presented. (EPA, 2010) The document was also reviewed by experts at the Marine Biological Laboratory in Woods Hole, MA, who approved of the methods used. (Valiela and Kinney, 2011)

<u>DES RESPONSE</u> **to 5- 58**

This section is a summary statement for comments **5- 46** through **5- 57**. See the responses to those comments.

<u>DES RESPONSE</u> **to 5- 59 and 5- 60 through 5- 65**

In section **5- 59**, the commenter claims that the Technical Advisory Committee (TAC) for the New Hampshire Estuaries Project reached scientific consensus on six points (**5- 60** through **5- 65**) that generally contradict the findings of the DES 2009 Report. In fact, the commenter has mischaracterized the minutes from the TAC meetings. Opinions offered by individuals, questions posed to the group, and comments on drafts have been represented by the commenter as "consensus", when they are not. A review of the full record shows that the purported "scientific consensus" is really a mixture of comments and questions taken out of context.

<u>DES RESPONSE</u> **to 5- 66**

The main claim from this section is that phytoplankton concentrations in the estuary are low and not increasing and, therefore, could not have affected eelgrass populations. First, as stated previously in response to comment **5- 6**, phytoplankton blooms are not the only way in which nitrogen can affect eelgrass populations. Second, the phytoplankton data cited in support of the claim are only from open bays where concentrations are low. In the tidal rivers, the 90th percentile concentrations of chlorophyll-a are much higher, ranging from 8 to 30 ug/L in tidal rivers with sufficient data (DES, 2012). Third, the commenter misrepresents several pieces of supporting evidence. In PREP (2009), Figure NUT3-5 actually demonstrates an increasing trend for chlorophyll-a in Great Bay. The EPA Peer Review of the DES 2009 Report was generally supportive (EPA, 2010). One of the peer reviewers made one statement regarding low levels of chlorophyll-a. The commenter has misrepresented the overall conclusions of the peer review by implying that this one statement was the conclusion of the peer review.

DES RESPONSE **to 5- 67**

The comment assumes that the only way in which nitrogen can affect eelgrass is through phytoplankton blooms that cause a reduction in water column transparency. In fact, there are multiple ways that excess nitrogen impacts eelgrass in the Great Bay Estuary. See response to comment **5- 6**. The transparency data in Great Bay cited by the commenter was from one near-shore location that did not necessarily reflect conditions in the whole bay. The commenter also references two EPA figures ("Figure 5-Gradient of Light Attenuation and Figure 4-Gradient of Chlorophyll-a") which do not appear in the DES 2012 303(d) Report.

Finally, the commenter claims that difference in median chlorophyll-a concentrations across the estuary is negligible. In fact, the data used for the 2012 assessments (DES, 2012) shows that the median chlorophyll-a concentration assessment units with sufficient data ranged from 1.5 to 7.1 ug/L. The 90^{th} percentile chlorophyll-a concentration ranged from 2.7 to 30 ug/L.

DES RESPONSE **to 5- 68**

The first half of this comment is a repeat of points made in **5- 24** to **5- 29**. See response to these points. The comment also claims that data from the tidal rivers do not show any significant relationship between algal levels and minimum DO occurrence. In fact, Figure 27 from the DES 2009 Report, which includes data from the tidal rivers, shows such a relationship (DES, 2009 at 49). Finally, Exhibits 2, 3, and 4 attempt to show that chlorophyll-a was not well correlated with water clarity and, therefore, that other factors such as turbidity and colored dissolved organic matter (CDOM) must be controlling light attenuation. The exhibits contain different types of graphs for the different rivers and, in the case of the Upper Piscataqua River graph, unproven assumptions about Secchi disk measurements were used. DES does not dispute that CDOM and turbidity are important factors related to water clarity in the tidal rivers. However, eelgrass was mapped in significant quantities in the tidal rivers in 1948 (DES, 2012 at 14). Average CDOM levels in the tidal rivers are not expected to have changed over time. Therefore, if naturally occurring CDOM and turbidity were the only factors controlling transparency (and presumably eelgrass survival) in the rivers, it would not have been possible for eelgrass to have existed in these areas at any point in history. See also response to **5- 32**.

DES RESPONSE **to 5- 69**

The comment implies that uncertainty in nutrient impairments requires a peer review. The comment also implies that DES agreed to propose new water quality standards for nutrients. Lastly, the comment implies that DES has asked for EPA regulatory decisions to be delayed until a peer review is complete. None of these statements are correct as explained in the following paragraphs.

First, the provisions of the MOA recognize that there is uncertainty regarding the specific mechanisms by which nitrogen impacts designated uses in the estuary, as there is with any scientific study. It was agreed in the MOA that this uncertainty could be reduced through a water quality model that GBMC was going to build and some additional work to study the evidence related to eelgrass loss. The MOA does not mention anything about a "peer review".

In reality, GBMC collected data but did not build the water quality model of the Squamscott River. The data collected by GBMC confirmed that dissolved oxygen concentrations in the river periodically fell below the state standard and that algae discharged from the Exeter wastewater treatment facility was a factor affecting dissolved oxygen levels. The study concluded that relationships between nutrients and dissolved oxygen were complicated but mass balance calculations showed that there was substantial algal growth in the Upper Squamscott River due to nutrient discharges (HydroQual, 2012).

DES followed up on its commitment to conduct more research on the scientific literature regarding macroalgae (for example, see comment **2- 1**) and completed new analyses of water quality in the estuary after controlling for salinity (DES, 2012b). This research confirmed DES's previous conclusions. DES also participated in two meetings to resolve scientific uncertainties with GBMC and other local experts in 2011. See response to comments **5- 70** through **5- 75**.

Second, in the MOA, DES committed to "Publish site-specific nitrogen criteria for each assessment zone on the 2010 list with impairments attributed to dissolved oxygen (DO) and nitrogen as soon as practicable after results of a calibrated, verified dynamic hydrodynamic and water quality model are available for the assessment unit." Therefore, this commitment was limited to the tidal rivers with DO impairments and was predicated upon GBMC building a water quality model for the Squamscott River. GBMC never completed this model.

Third, in MOA, DES agreed to support a delay in EPA actions to finalize permits until early 2012 to allow GBMC to complete the water quality model for the Squamscott River. Again, GBMC never completed the model. Regardless, EPA's final permitting decisions did not occur until 2013.

<u>*DES RESPONSE*</u> to 5- 70 through 5- 75

In sections **5- 70** through **5- 75**, the commenter presents alleged, technical conclusions from "a group of UNH researchers, DES, Coalition members, and Coalition members' consultants". The commenter claims that these statements are conclusions drawn by the group when, in fact, no group consensus was reached. Therefore, the conclusions only represent the commenter's own opinions.

The commenter provided two exhibits with meeting notes in support of the claims. The meeting notes were not formal minutes that were agreed upon by all participants. As such, the statements in the notes may or may not reflect what someone really said. One thing the notes appear to be clear about is that this group provided "input to the process, but is not a peer review." (Commenter's Exhibit 15 at 1)

<u>*DES RESPONSE*</u> to 5- 76

This comment clearly misrepresents the record of phone conversations between Dr. Fred Short and EPA (Exhibits 16 and 17). The commenter summarized the phone conversations as "Dr. Fred Short acknowledged that the primary issue in Great Bay is macroalgae and the he did not know why the eelgrass population in Little Bay failed to recover."

The actual text from the record of the phone conversations shows that the commenter's summary is incorrect.

> *"Fred informed me that the issue with Great Bay proper is mostly macro algae. Because the eelgrass beds in this portion of the estuary are intertidal (i.e. exposed at low tide) the plants are able to receive a significant amount of light during low tides. However, he did say that light attenuation is still an issue in this area because during high tide the plants are not getting enough light due to high light attenuation coefficients in the water column. In other portions of the estuary the eelgrass beds are subtidal (i.e. submerged during all phases of the tide) and light attenuation is a major issue in these areas."* (Commenter's Exhibit 16)
>
> *"For the subtidal beds light attenuation is a significant issue. For the intertidal beds light attenuation is not the major issue since the beds can get their light needs at low tide."* (Commenter's Exhibit 17)
>
> *"Another issue which Fred has been noticing is that the eelgrass in the estuary is putting significant energy into reproduction. The plants are produces a very high number of seeds. This is a typical survival response. When stressed, the plants will put more energy into reproduction to maintain the population. This takes away energy from plants growing and creating more shoots. Fred noticed there was a bed of eelgrass that appeared in Little Bay this year (his did not indicate the size) where it had disappeared. He said this bed is unlikely to survive because of it is intertidal and the light attenuation is poor."* (Commenter's Exhibit 16)

DES RESPONSE **to 5- 77**

This section is a summary statement for comments **5- 59** through **5- 76**. See the responses to those comments.

DES RESPONSE **to 5- 78**

This section repeats many of the same claims from previous sections. The primary new question raised is that eelgrass losses in Great Bay occurred in shallow areas and, therefore, cannot be related to lower water transparency. However, as stated in response to **5- 23**, reductions in water transparency are not the only way in which nitrogen can affect eelgrass populations. In shallower areas, overgrowth and smothering by macroalgae and/or cellular disruption may be the immediate cause of eelgrass loss. In fact, the commenter acknowledges that eelgrass habitat losses in shallow areas could be evidence "that macroalgae or shoreline development is adversely impacting eelgrass populations." The commenter again attributes conclusions to Dr. Fred Short that do not accurately describe what Dr. Short was recorded as saying in EPA telephone logs presented as Exhibits 14 and 15 (see also response to comment **5- 76**). Exhibit 17 provided by the commenter in support of his argument did not have anything to do with the point being made. Instead of being a presentation by Fred Short, Exhibit 17 was a graph from the DES 2009 Report. Finally, the commenter argues that the light attenuation coefficient in Great Bay was approximately 1.0 m^{-1} when eelgrass was "faring well". This statement is unsubstantiated. Eelgrass in Great Bay has been declining since 1996. The first direct measurements of the light attenuation coefficient were made in 2003. Data on Secchi disk depth were collected by volunteers near the shore in the 1990s but the relationship between these near-shore Secchi disk measurements and the light attenuation coefficient measured in deeper waters is variable and unknown for Great Bay.

DES RESPONSE **to 5- 79 through 5- 83**

The commenter argues that the cause of eelgrass decline in Little Bay and the tidal rivers is unknown. However, the evidence presented in support of this claim either misrepresents the documents cited, omits important information, or is speculative. For example:

- The commenter's claim that a report from DES "confirms that losses of eelgrass were attributed to multiple episodes of wasting disease," fails to represent that the same report states that eelgrass populations recovered after the wasting disease events.
- The commenter claims that a DES report shows that the loss of eelgrass in the Piscataqua River "has been attributed to the 1984 wasting disease outbreak". In fact, the report stated that only the eelgrass loss in this area between 1981 and 1984 was attributed to a wasting disease outbreak. (DES, 2008 at 13, emphasis added)
- The commenter claims that a DES report shows that recovery from wasting disease outbreaks can take up to 50 years. In fact, the report stated that, in France, eelgrass beds were still recovering in 1950 following a large wasting disease event in 1931-1932. (DES, 2008 at 8).
- The commenter claims that "the 2009 PREP report confirmed the cause of the loss was unknown." In fact, the section of the 2009 PREP report dedicated to eelgrass does not contain the word "unknown" (PREP, 2009b). This report, plus the more recent 2013 PREP report, both clearly document declining trends for eelgrass in the Great Bay Estuary. The 2013 PREP report affirms that the declining eelgrass trends are "not related to wasting disease". (PREP 2013 at 20)
- The commenter repeats his claim that eelgrass cannot grow in the tidal rivers because of the turbidity and color. See response to **5- 32**.
- The commenter cites a phone conversation with Dr. Fred Short as evidence that "Dr. Fred Short acknowledged that he does not know why the eelgrass population in Little Bay failed to recover." In fact, the only information about Little Bay in the phone record does not support this claim. It states, "Fred noticed there was a bed of eelgrass that appeared in Little Bay this year (his did not indicate the size) where it had disappeared. He said this bed is unlikely to survive because of it is intertidal and the light attenuation is poor." (Commenter's Exhibit 16)
- The commenter's statement that "elevated river flow during the eelgrass' primary growing season caused increased color load," is speculative because there are no data to support it.

- The commenter claims that the Bellamy River has the "highest water quality" and, therefore, should not have lost as much eelgrass as other rivers. In fact, the median total nitrogen concentration in the Bellamy River is 0.455 mg/L, which is similar to other sections of the estuary where eelgrass losses have occurred.

Note: The commenter's citations for "2008 CWA 303(d) Listing Methodology and Assessment" are incorrect. They actually refer to a DES report titled "Methodology and Assessment Results related to Eelgrass and Nitrogen in the Great Bay Estuary for Compliance with Water Quality Standards for the New Hampshire 2008 Section 303(d) List" (dated 8/11/2008), available at:
http://des.nh.gov/organization/divisions/water/wmb/swqa/2008/documents/appendix_05_eelgrass_calm.pdf.

DES RESPONSE **to 5- 84**

This comment mischaracterizes a study of dissolved oxygen in Squamscott River by GBMC (HydroQual, 2012). The commenter argues that the report findings disprove DES's understanding that instream nitrogen concentrations result in algal growth which causes periodic low dissolved oxygen and that reducing algal and nitrogen levels will result in attainment of the dissolved oxygen standard. In fact, the actual conclusions of the report confirm the DES understanding. On Page 14 of the report, HydroQual states that "best professional judgment indicate that with an upgrade of the Exeter WWTP to an activated sludge system with a monthly TN limit of 8 mg/L there will be a substantial reduction in Squamscott River chl-a levels and an increase in river DO." (HydroQual 2012 at 14) This conclusion contradicts the conclusions attributed to the report by the commenter.

DES RESPONSE to **5- 85**

In this section, the commenter claims that the Squamscott River study confirmed that elevated algae was not an indicator of poor dissolved oxygen. In fact, as discussed above in **5- 84**, the Squamscott River study, funded by GBMC, concluded the opposite. The commenter repeats a misrepresentation of the findings from the study of the Squamscott River by Jones et al. (2007). See response to **5- 46**. The commenter argues that the impact of algal growth on dissolved oxygen is negligible. However, the long-term average values presented underestimate the scale of day-to-day impacts during blooms and the effects of sediment oxygen demand. Finally, the commenter misrepresents the data from the 2009 PREP State of the Estuaries report (PREP, 2009). These data show the percent of days during summer months with violations of the dissolved oxygen standard relative to the number of days in that year with valid data. The number of days with valid data varies across years. Therefore, comparisons cannot be made between two years with different nitrogen loading unless the amount of valid dissolved oxygen data is the same for the two years. The same data are presented in a clearer format in the 2013 PREP report (PREP, 2013).

DES RESPONSE **to 5- 86**

The narrative water quality standards for Biological and Aquatic Community Integrity states that "Difference *from naturally occurring conditions* shall be limited to non-detrimental differences in structure and function." (Env-Wq 1703.19(b) emphasis added) Therefore, the commenter argues that the absence of eelgrass would not constitute a violation if the absence was due to underlying natural causes. The assessment methodology for eelgrass habitat used by DES already accounts for natural and other causes of eelgrass loss. If there is significant eelgrass loss in an assessment unit, DES will review the available information for that area to determine if there are known reasons for the loss. (DES, 2012d at 58) Moreover, a nitrogen impairment will only be assigned to that assessment unit if there are sufficient data to show both significant eelgrass loss and elevated nitrogen concentrations. DES also specifically maintains flexibility to alter the assessment methodology if local conditions warrant.

The commenter's arguments regarding the viability of eelgrass habitat in the tidal rivers have already been addressed in response to **5- 32**. Exhibit 19 used by the commenter to support this argument is not relevant to the tidal rivers because the data included in the exhibit are from the middle of Great Bay.

DES RESPONSE to 5- 87

Information about eelgrass biomass was considered as supplemental information for assessments of areas with significant eelgrass cover. The indicator of eelgrass cover does not measure the thinning of beds, which is also a loss of habitat and ecosystem services. Biomass is calculated by multiplying the eelgrass area by the eelgrass density following the methods established by the Piscataqua Region Estuaries Partnership (PREP, 2012 at 238). Eelgrass biomass was not treated as a stand-alone indicator because the error in the biomass estimates is larger than for the eelgrass cover indicator and the magnitude of this error has not yet been quantified (DES, 2008).

For the 2012 assessments, eelgrass biomass data were considered for the assessments of the Great Bay, Little Harbor, and Portsmouth Harbor – the three areas where large eelgrass beds remain. The eelgrass biomass data did not drive the impairment determinations in these areas. However, the biomass data provided important supplemental information regarding the thinning of eelgrass beds in these areas. Review of the biomass data is consistent with the requirement that DES review all existing and readily available information for assessments. (40 CFR 130.7(b)(5) and 130.10(d)(6))

DES RESPONSE to 5- 88 and 5- 89

The commenter requested that DES "remove N-based and Chl a-based violations from water bodies in which there is no DO data showing violation of numeric DO criteria." The same commenter posed essentially the same questions to DES during the public comment period on the 2012 Consolidated Assessment and Listing Methodology. DES responded to these comments on April 20, 2012 (DES, 2012b at 14). The DES response is reproduced below.

> *For the 2010 and 2012 assessments, the tidal Cocheco River was the only assessment unit for which a nitrogen impairment was based on exceedences of the chlorophyll-a criteria but not the dissolved oxygen criteria. A detailed explanation for this impairment is provided below.*
>
> *For the tidal Cocheco River assessment unit, the total nitrogen and chlorophyll-a thresholds for the prevention of low dissolved oxygen (0.45 mg/L median total nitrogen and 10 ug/L 90th percentile chlorophyll-a) are the applicable thresholds for the stressor-response matrix assessment. This assessment unit was listed as impaired for nitrogen on the 2010 303(d) list because of high nitrogen concentrations (TN median = 0.763 mg/L,*

n=21) and exceedences of the chlorophyll-a threshold (90^{th} percentile = 11.9 ug/L, n=32). For the 2012 assessment cycle, there were insufficient nitrogen data for a new assessment but the available data continued to show high nitrogen (TN median = 0.99 mg/L, n=3) and high chlorophyll-a concentrations (90^{th} percentile = 62 ug/L, n=5). The nitrogen impairment from the 2010 303(d) list will be retained because: (1) Assessment units that were impaired in the previous cycle cannot be removed from the 303(d) list if there are insufficient data to make a new assessment; and (2) the limited data available continue to indicate high nitrogen and high chlorophyll-a concentrations in this assessment unit. It should be noted that the Cocheco River has also been classified as impaired for nitrogen under the Primary Contact Recreation designated use due to high chlorophyll-a concentrations.

Similar to the 2010 assessment, grab sample data for dissolved oxygen reviewed for the 2012 cycle did not fall below standards, but these results were not considered representative of dissolved oxygen in the assessment unit. Half of the grab samples were collected at station (GBCW-17), which is just downstream of the rapids in downtown Dover where the water is almost fresh, fast-moving, and well aerated. Only one sample was collected in an area of slower water movement near the mouth of the river and this sample had dissolved oxygen levels less than 6 mg/L and <70% saturation. No high-frequency datasonde measurements were available. Therefore, the dissolved oxygen measurements in this assessment unit are not likely to be representative of conditions in slower-moving areas where dissolved oxygen exceedences would occur. High frequency datasonde measurements of dissolved oxygen, which provide more accurate and representative data, are needed to characterize conditions in slower-moving sections of the Cocheco River. In the meantime, dissolved oxygen and dissolved oxygen saturation will be categorized as "insufficient information". (DES, 2012b at 14)

This response clearly shows that DES is not "simply ignoring" data suggesting numeric compliance for dissolved oxygen in tidal rivers, like the Cocheco.

The commenter includes a citation to the fact sheet for the 1997 NPDES permit for the Rochester wastewater treatment facility stating that the wastewater treatment facility discharge will not cause dissolved oxygen to be less than the state standard. However, the Rochester discharge is to the freshwater portion of the Cocheco River, over 8 miles upstream of the estuary. The NPDES fact sheet specifically refers to the effects of the discharge on the freshwater portion of the river. Therefore, this reference is not relevant to the assessments of dissolved oxygen in the tidal portion of the river. The fact sheet was written 16 years ago and, therefore, does not include the important information on the estuary that has been obtained in the last decade.

DES RESPONSE **to 5- 90**

The commenter incorrectly assumes that only the most recent year of eelgrass data is used in the assessments. Actually, the assessment methodology for eelgrass states that: "To avoid spurious impairments from one year of data, the median eelgrass cover from the last three years of data (in this case, 2003-2005) will be compared to the historic eelgrass cover." (DES, 2008 at 6)

The standard assessment methodology for eelgrass in the Great Bay continues to show significant eelgrass loss in this area. A summary of the results is provided below:

> *"In the Great Bay itself, both eelgrass cover and eelgrass biomass are in decline (Figure 3). The current (2010) extent of eelgrass cover in Great Bay is 1,722.2 acres and the median extent in 2008-2010 was 1,700.6 acres, which is a -20.2% change from its historical extent of 2,130.7 acres. There has been a steeper trend (-54%) in eelgrass biomass loss because of thinning of the eelgrass beds."* (DES, 2012 at 7).

DES RESPONSE **to 5- 91 and 5- 92**

These sections repeat comments **5- 32** and **5- 86**. See responses to those sections.

DES RESPONSE **to 5- 93**

All of the issues raised in this comment have been addressed. See responses to **5- 35** and **5- 36**, **5- 76**, and **5- 79** through **5- 83**.

DES RESPONSE **to 5- 94**

All of the issues raised in this comment have been addressed. See responses to **5- 84** and **5- 85**.

COMMENT # 6: Dean Peschel, Great Bay Municipal Coalition (GBMC)

Comment letter #6 was received on October 18, 2012 after the close of the public comment period (July 5, 2012).

***<u>DES RESPONSE</u> to* 6- 1**

The commenter forwarded to DES an article about the effects of nutrient enrichment on salt marshes (see *http://www.unh.edu/campusjournal/2012/10/excess-nutrients-collapsing-east-coast-salt-marshes-scientists-show*) (Deegan et al., 2012). DES agrees that this article demonstrates one of the many detrimental long-term impacts that are initiated by excess nutrient in an estuarine system. There is a striking difference between the immediate short-term impacts and the long-term degradation impacts of the excess nutrient loading. Further, the long-term negative feedback loop initiated by the loss of salt marshes, which in their natural state capture and remove excess nutrients, then leads to higher nutrient concentrations in the water.

COMMENT # 7: Dean Peschel, Great Bay Municipal Coalition (GBMC)

Comment letter #7 was received on November 2, 2012 after the close of the public comment period (July 5, 2012). On November 19, 2012, DES sent a letter to the commenter that stated:

> "*On April 20, 2012, the Department released a draft of the 2012 303(d) list for public comment. The comment period closed on July 5, 2012. The Great Bay Municipal Coalition submitted timely comments on the draft on July 2, 2012. Your November 2, 2012 letter was received after the close of the comment period. However, the Department will take any new points raised in the letter under consideration as we work toward issuing a final 2012 303(d) list.*"

Therefore, DES will only respond to issues that have not already been raised by the commenter in his previous letters.

<u>DES RESPONSE</u> **to 7- 1**

The commenter argues that the assessment methodology used by DES does not meet the "burden of proof required to classify specific waters as violating the existing narrative criteria for aquatic integrity or nutrients."

However, in fact, the process used by DES is fully compliant with the federal regulations governing the impaired waters list:

> *"…each State shall submit to EPA for review , approval, and implementation … a list of those waters within the State which after the application of effluent limitations required under section 301(b)(2) of the CWA cannot reasonably be anticipated to attain or maintain … that water quality <u>which shall assure</u> protection of public health, public water supplies, agricultural and industrial uses, and the <u>protection and propagation of a balanced population of shellfish, fish and wildlife</u>, and allow recreational activities in and on the water"*. (40 CFR 130.10(d)(1) emphasis added)
>
> *"Each state shall assemble and evaluate all existing and readily available water quality-related data and information and each state shall develop the lists required by paragraphs (d)(1), (2), and (3) of this section based upon this information."* (40 CFR 130.10(d)(5))
>
> *"Each state shall provide documentation to the Regional Administrator to support the state's determination to list or not to list waters as required by paragraphs (d)(1), (d)(2), and (d)(3) of this section."* (40 CFR 130.10(d)(7))

<u>DES RESPONSE</u> **to 7- 2** through **7- 7**

In this section, the commenter attempts to show that DES admitted certain facts about the impact of nitrogen on the Great Bay Estuary in an October 19, 2012 letter. However, the commenter has grossly mischaracterized the cited letter.

In the letter, DES was responding to claims by GBMC. DES reproduced each of the GBMC's claims followed by the DES response. The commenter has apparently become confused about which statement is the original GBMC claim and which statement is the DES response. The statements listed in **7- 2** through **7- 7** are the GBMC's original claims, not the DES responses or the DES position on this issue. It is extremely clear which sections of the October 19, 2012 letter contain the GBMC claims and which contain the DES responses. The full DES letter of October 19, 2012 is attached after the References section of this response to comments.

DES RESPONSE **to 7- 8**

There are no new issues raised in this comment. See responses to 5- 20 through 5- 22, 5- 35, and 5- 36. However, it should be noted that the "alleged 'protective' nitrate concentration" cited by the commenter is exclusively the opinion of the commenter. DES does not use any thresholds for nitrate concentrations for 303(d) assessments.

DES RESPONSE **to 7- 9**

This comment misrepresents the actual conclusions of the Nettleton et al. (2011) study. The study concluded that:

> *"Great increases in both mean and peak Ulva and Gracilaria biomass and percent cover have occurred in the Great Bay Estuarine System. These changes coincide with increases in water nitrogen levels observed over the past two decades. The increases in nuisance algal blooms are likely the result of increased nutrient loading in the bay, and, in the case of Gracilaria vermiculophylla, may also be a symptom of a harmful invasion. Current nitrogen levels in the system are substantial enough to support even larger Ulva and Gracilaria blooms than were observed in this study, based on minimum growth requirements. If efforts are not made to reduce nutrient inputs, such harmful algal blooms, and their related side effects of hypoxia and habitat alteration, should be expected in the Great Bay Estuarine System for the foreseeable future."* (Nettleton et al., 2011 at 82)

Moreover, the "physical evidence" allegedly contradicting the Nettleton et al. (2011) study are only photographs taken from shore on one day in the fall of 2012 at some of the sites evaluated by Nettleton. The observations were not documented or reviewed by anyone else and autumn is not the worst case season for macroalgae biomass. In contrast, the Nettleton study consisted of five sites that were each visited 10 times over two years covering all seasons. During each site visit, macroalgae was measured at 40 locations along standardized transects. Therefore, it cannot be argued that a handful of photographs from one day disprove the 2,000 careful observations summarized in the Nettleton study.

DES RESPONSE **to 7- 10**

There are no new issues raised by this comment. See responses to **5- 20** through **5- 22**, **5- 24** through **5- 29**, **5- 46**, **5- 84**, and **5- 85**.

DES RESPONSE **to 7- 11**

There are no new issues raised by this comment. See responses to **5- 32** and **5- 86**.

<u>DES RESPONSE</u> **to 7- 12**
There are no new issues raised by this comment. See responses to **5- 20** through **5- 22** and **5- 79** through **5- 83**.

<u>DES RESPONSE</u> **to 7- 13**
There are no new issues raised by this comment. See responses to **5- 6**, **5- 23**, **5- 24** through **5- 29**, **5- 32**, **5- 35** through **5- 36**, **5- 79** through **5- 83**, and **5- 86**.

<u>DES RESPONSE</u> **to 7- 14**
There are no new issues raised by this comment. See responses to **5- 33** and **5- 34**.

<u>DES RESPONSE</u> **to 7- 15**
This section is a salutation. No response needed.

<u>DES RESPONSE</u> **to 7- 16 through 7- 39**
These sections are purported to be findings from depositions provided as supporting evidence to the comments in the letter. DES has responded to the specific comments in the letter even though the comments were not timely.

C. PUBLIC COMMENT ON THE DRAFT 2012 SECTION 303 (D) LIST

COMMENT # 1: Eric Swope, Industrial Pretreatment Coordinator, City of Keene

City of Keene

350 Marlboro Street New Hampshire 03431-4373

May 17, 2012

Mr. Ken Edwardson
New Hampshire Department of Environmental Services
Watershed Management Bureau
29 Hazen Drive, P.O. Box 95
Concord, New Hampshire 03302-0095

Re: Draft 2012, 303(d) List of Impaired Surface Waters for New Hampshire. 1- 1

Comments:
Propose de-listing from Impaired Waters List Ashuelot River Assessment Unit ID NHRIV802010301-11, Dissolved Oxygen Saturation

Dear Mr. Edwardson,

The section of the Ashuelot River designated as Assessment Unit NHRIV802010301-11 was listed in the 2010 303(d) List of Impaired Surface Waters for New Hampshire and remained on the Draft 2012 List. The City of Keene has collected and reviewed environmental monitoring data from the summer of 2010 and provides the comment that this section of river should be de-listed for dissolved oxygen impairment.

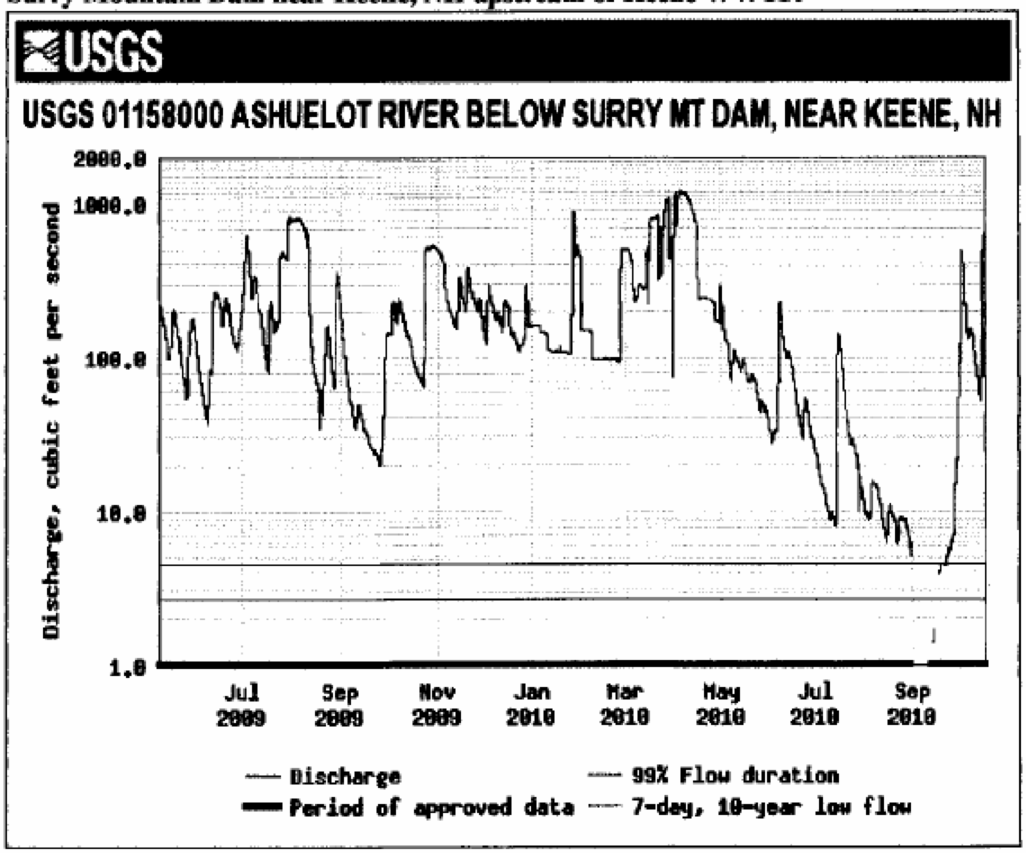
Since this assessment unit of the Ashuelot River was listed in the 303(d) List of Impaired Surface Waters for New Hampshire, several factors have improved effluent from the Keene WWTP and resulted in improved water quality downstream, including:

- Keene Wastewater Treatment Plant (WWTP) operations staff have fine-tuned the operation of the aeration basin, including use of anaerobic and anoxic zones for enhanced treatment resulting in greatly improved phosphorus removal efficiency.
- Since 2004, the WWTP has added polyaluminum chloride (PAC) prior to the secondary clarifier to aid in removal of metals. Beginning in 2009, WWTP operations has also optimized use of PAC prior to the primary clarifier on an "as needed" basis to aid in removal of phosphorus. 1- 2
- The WWTP has added SCADA monitoring of several parameters at key points in the WWTP for enhanced process monitoring and control.
- WWTP process changes have resulted in reduction of solids, and any pollutants tied up in these solids, in the final effluent.

- City of Keene staff have embarked on public education efforts to inform residents and business owners of practices to reduce stormwater runoff pollution upstream of the WWTP.

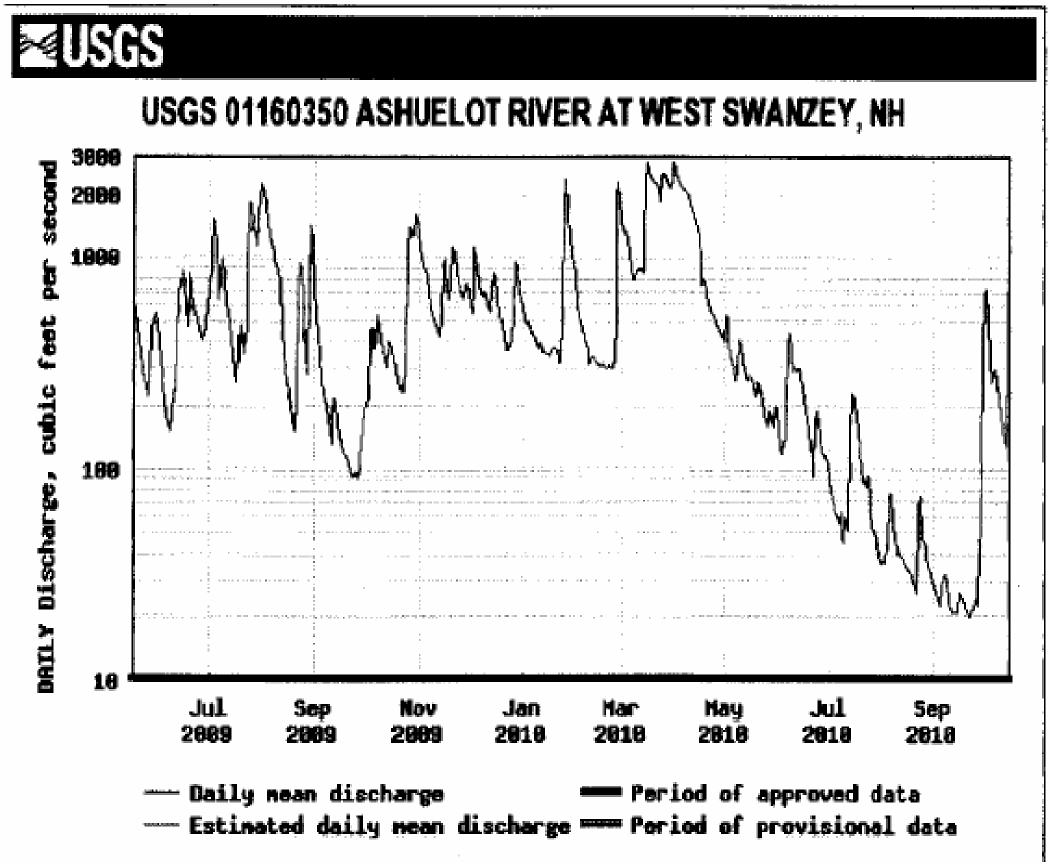
In 2010, the City of Keene undertook an extensive sampling program in the Ashuelot River within Assessment Unit NHRIV802010301-11, the portion of the river that includes the Keene WWTP. Specifically, dissolved oxygen, temperature, phosphorus and chlorophyll a samples were collected at site 16-D ASH upstream of the Keene WWTP outfall, and at site 16-B ASH downstream of the WWTP outfall but immediately upstream of the South Branch confluence with the Ashuelot River.

Figure 1. Ashuelot River flow data July 2009- September 2010 as measured below the Surry Mountain Dam near Keene, NH upstream of Keene WWTP.



1- 3

Figure 2. Ashuelot River flow data July 2009- September 2010 as measured at West Swanzey USGS station downstream of Keene WWTP.

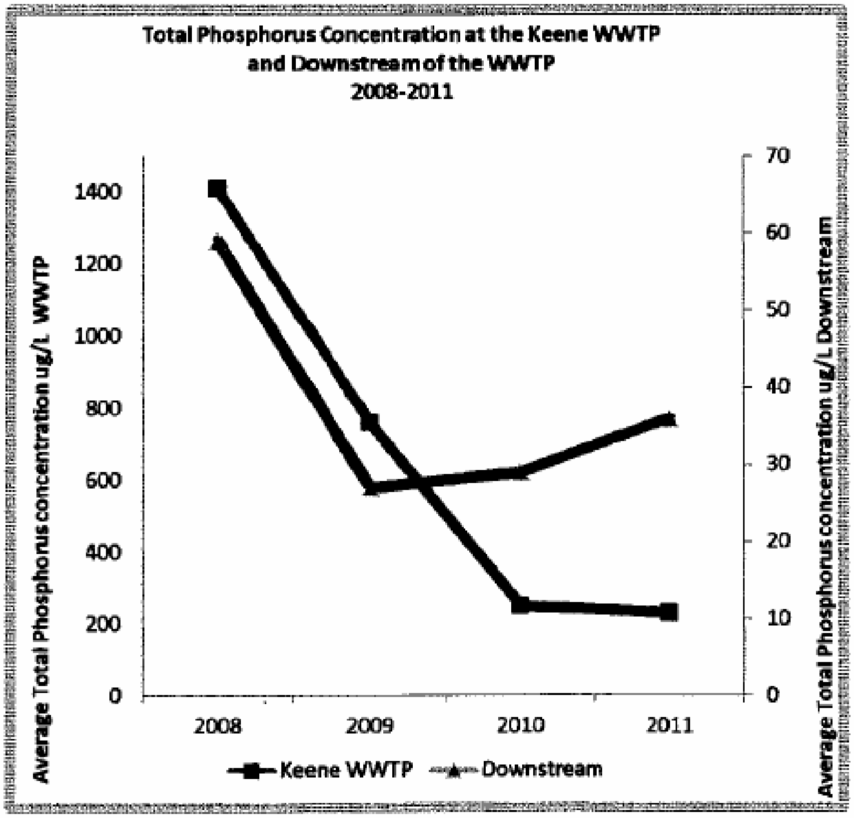


Sampling was conducted during the months of July-September 2010 at a time when river flows were extremely low. The data was submitted to New Hampshire Department of Environmental Services (NH DES) on September 12, 2010 and entered into the Environmental Monitoring Database by NHDES staff in September 2010. Quality Control/Quality Assurance information was also submitted at that time. 1- 4

According to an April 2, 2004 communication from NH DES, the 7Q10 upstream of the Keene WWTP is 12.19 cfs (Attachment 1). Figures 1 and 2 show that flow measurements taken during the 2010 sampling period at the Surry Mountain Dam USGS station upstream of the Keene WWTP, and at the West Swanzey USGS station downstream of the WWTP, were near or below 7Q10 values. 1- 5

Figure 3 below shows the downward trend in phosphorus concentrations in Keene WWTP effluent and the Ashuelot River downstream of the WWTP outfall. 1- 6

Figure 3. Average Phosphorus Concentrations in Keene WWTP Effluent and Ashuelot River Downstream of WWTP.



The water quality sample data collected between July and September 2010 demonstrated that the Ashuelot River in this section met water quality criteria for dissolved oxygen saturation daily averages and instantaneous minimum dissolved oxygen concentration under very low flow conditions. **Therefore this section of river should be de-listed from the 303(d) list for dissolved oxygen saturation.**

If you have any questions or concerns, please contact either Donna Hanscom, Assistant Director of Public Works, at 352-6550, or me at 357-9836, ext, 6504 or eswope@ci.keene.nh.us. **1- 7**

Sincerely,

Eric Swope
Industrial Pretreatment Coordinator

Cc: Donna Hanscom, Assistant Director of Public Works
Kürt Blomquist, Director of Public Works

Attachment 1. Ashuelot River 7Q10 Upstream of City of Keene WWTP

The 7 Q10 for the Ashuelot River was provided in an email from George Berlandi, of the NH Department of Environmental Services. The text is included below. The calculated flow converts to a 7Q10 = 7.885 MGD.

From: Firmin, Alvin [FirminAC@cdm.com]
Sent: Monday, April 05, 2004 1:06 PM
To: Donna Hanscom; 'aws@rathlaw.com'
Cc: Osgood, Jennifer; Heineman, Mitchell
Subject: FW: 7Q10 for Keene

-----Original Message-----
From: Berlandi, George [mailto:gberlandi@des.state.nh.us]
Sent: Friday, April 02, 2004 10:53 AM
To: Firmin, Alvin
Cc: Comstock, Gregg; Dudley, Dan
Subject: 7Q10 for Keene

Hi Al,

As promised you, we have re-looked at all of the information that we have on the above subject and have calculated the 7Q10 upstream of the City of Keene's wastewater treatment plant discharge to be 12.19 cfs.

At a design flow of 9.3 cfs and using only 90% of the assimilative capacity, he dilution factor would be 2.08.

Hope this helps. Take care

.B.

1- 8

COMMENT #2: Dr. Arthur C. Mathieson, Professor of Plant Biology, Jackson Estuarine Laboratory & Department of Biological Sciences

Nutrients and Macroalgal problems within the Great Bay Estuary System

Dr. Arthur C. Mathieson

Professor of Plant Biology

Jackson Estuarine Laboratory & Department of Biological Sciences

Univesity of New Hampshire

Durham, NH, 03824

Background and personal observations

I have worked at the Jackson Estuarine Laboratory (JEL) since its dedication in 1967 and studied the ecology of the Great Bay Estuarine System (GBES) and its seaweed populations for over 4.5 decades. I was also responsible for directing the nutrient monitoring program for JEL (1970-1981), which was the primary "bench-mark" characterizing earlier hydrographic/nutrient conditions. It is in this context that I comment regarding the macroalgal problems within the Bay. Prior to the 1980s no major algal blooms were apparent and the nutrient levels were much lower than today (cf. Mathieson and Hehre, 1981). During the past 2-3 decades the following macroalgal patterns have occurred along with increased nutrients:

2- 1

(1) (1) Extensive ulvoid green algae (*Ulva* spp.) or "green tides (Fletcher, 1996) have begun to dominate many of these estuarine areas during the past 15-20 years, particularly within Great Bay proper (Nettleton et al. 2011). Such massive blooms of foliose green algae can entangle, smother and cause the death of eelgrass (*Zostera marina*) within the low intertidal/shallow subtidal zones (pers. obs. A C Mathieson). They primarily represent annual populations that can also regenerate from residual fragments buried in muddy habitats.

(2) (2) The introduced Asiatic green alga *Ulva pertusa* has recently contributed and exacerbated these "green tide" events, along with the dominant species *U. lactuca* (sea lettuce) and *U. compressa* (Hofmann et al., 2010).

(3) (3) The"guanotrophic" green alga *Prasiola stipitata* suddenly appeared in the upper intertidal zone near Dover Point. It represents a disjunct open coastal taxon that is usually found in high intertidal bird roockeries with large quantities of guano. During the mid 1980's it was not recorded inland from Fort Constitution on the Piscataqua River (Mathieson and Hehre, 1986; Mathieson and Penniman, 1986), and its sudden appearance correlates with the "recent" transfer of Dover's sewage discharges from the Cocheco River to the Piscataqua River/Little Bay area.

(4) (4) The Asiatic red alga *Gracilaria vermiculophylla* was recently introduced to the GBES (Nettleton et al. submmitted) and is causing even greater macroalgal blooms than the "green tide" seaweeds. In contrast to *Ulva* it is a perennial, long-lived taxon that is more tolerant to desiccation than the native species *G. tikvahiae.* As a consequence it now forms extensive wind rows 1-2 feet deep within the low intertidal and subtidal zones of many Little and Great Bay sites (pers. obs. A C Mathieson). Like *Ulva* spp. its massive blooms can entangle, smother and cause the death of eelgrass within the low

intertidal/shallow subtidal zones.

(5) (5) Extensive epiphytic growths of seaweeds on eelgrass (*Zostera marina*) have also occurred during the past 15-20 years, particularly within Great Bay proper (pers. obs. A C Mathieson). These epiphytes, which are mostly filamentous red algae and colonial diatoms, may completely cover the fronds of eelgrass, limiting the host's growth and photosynthesis and compromising its viability.

<u>Supportive scientific studies</u>

Schubert (1984) states that macroalgae are good indicators of nutrient levels, as they lack roots, their tissues absorb nutrients directly, and they closely reflect water column contents (cf. Lapointe et al., 1992; Horrock et al., 1995). Goshorn et al. (2001) summarized several studies indicating that a large increase in macroalgal biomass is most often associated with eutrophication. Valiela et al. (1992, 1997) found that a rise in nutrients increased algal biomass 3-4 levels of magnitude, shading out eelgrass, creating more anoxic events, and changing benthic faunal communities. Hauxwell et al. (1998) found that as nitrogen loading increased macroalgal biomass increased by as much as 300%. Microcosm experiments by Fong et al. (1993) showed that nitrogen levels directly controlled macroalgal biomass, which in turn controlled levels of phytoplankton that were subsequently documented by enhanced chlorophyll levels.

<u>Summary comments</u>

Based upon the above observations and scientific data, eutrophication is creating an unstable and negative situation within the GBES, which needs to be quickly rectified. In retrospect these green and red (*Gracilaria*) algal blooms are typical of stressed estuarine systems like those found within Waquoit Bay, MA, Narragansett Bay, RI, and the middle Atlantic coastal estuaries within Delaware, Maryland, and Virginia.

<u>References</u>

Fletcher, R. L. 1996. The occurrence of "green tides": A review. In: W. Schramm and P. H. Nienhuis (eds.). Ecological Studies, Vol. 123. Marine Benthic Vegetation: Recent Changes and the Effects of Eutrophication. Springer-Verlag, pp. 1-43.

Goshorn, D., M. McGinty, C. Kennedy, C. Jordan, C. Wazniak, K Schwenke, and K. Coyne. 2001. An examination of benthic macroalgae communities as indicators of nutrients in middle Atlantic coastal estuaries- Maryland component. Final report 1998-1999. Maryland Dept. Natural Resources, Annapolis, MD, 21401, 39 pp (no pagination).

Hofmann, L. C., C. D. Neefus and A. C. Mathieson. 2009. Biodiversity and bioremediation potential of <u>Ulva</u> spp. populations in the Great Bay Estuarine System, p. 18. In: Abstracts, 48th Northeast Algal Symposium, 17-19th April, 2009, Univ. Massachusetts, Amherst, p. 18.

______, J. C. Nettleton, C. D. Neefus and A. C. Mathieson. 2010. Cryptic diversity of <u>Ulva</u> (Ulvales, Chlorophyta) in the Great Bay Estuarine System (Atlantic USA): introduced and indigenous distromatic species. European J. Phycol. 45: 230-239.

Horrocks, J. L., G.R.Stewart and W. C. Dennison. 1995. Tissue nutrient content of *Gracilaria* spp. (Rhodophyta) and water quality along an estuarine gradient. Mar. Freshwater Res. 46:975-983.

LaPointe, B. E., M. M. Littler, and D. S. Littler.Nutrient availability to marine macroalgale in siliciclastic versus carbonate-rich coastal waters. Estuaries 15: 75-82.

Mathieson, A. C. and E. J. Hehre..1981. A synopsis of New Hampshire seaweeds. Rhodora 88:1-139.

Mathieson, A. C. and C. A. Penniman. 1986. Species composition and seasonality of New England seaweeds along an open coastal-estuarine gradient. Bot. Mar. 29: 161-176.

Nettleton, J., C. Neefus, A. Mathieson and L. G. Harris. 2011. Tracking environmental trends in the Great Bay Estuarine System through comparisons of historical and present-day green and red algal community structure and nutrient content. Publ. Great Bay National Estuarine Research System, Stratham, NH., 101 pp.

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Valiela, I., K. Forean, M. LaMontagne, D. Hersch, J. Costa, Peckol, B. DeMeo-Anderson, C. D'Avanzo, M. Bbione, C. Sham, J. Brawley, and K. Lajtha. 1992. Coupling of watersheds and coastal waters: sources and consequences of nutrient enrichment in Waquoit Bay, Massachusetts. Estuaries 15: 443-457.

Valiela, I., J. McClelland, J. Hauxwell, P. J. Behr, D. Hersh, and K. Foreman. 1997. Macroalgal blooms in shallow estuaries: controls and ecophysiological and ecosystem consequences. Limnol. Oceanogr. 42: 1105-1118.

COMMENT # 3: Tom Irwin Esq., Vice President & NH-Director, Conservation Law Foundation

clf

conservation law foundation

For a thriving New England

CLF New Hampshire 27 North Main Street
Concord, NH 03301
P: 603.225.3060
F: 603.225.3059
www.clf.org

June 25, 2012

RECEIVED

JUN 2 6 2012

DEPARTMENT OF ENVIRONMENTAL SERVICES

2012, 303(d) Comments (Attn: Ken Edwardson)
N.H. Department of Environmental Services
Watershed Management Bureau
29 Hazen Drive, P.O. Box 95
Concord, NH 03302-0095

Re: Comments on Draft 2012 303(d) List of Impaired Surface Waters for New Hampshire

Dear Mr. Edwardson:

I am writing on behalf of the Conservation Law Foundation (CLF) regarding those aspects of the draft 2012 Section 303(d) impaired waters list pertaining to impairment designations in the Great Bay estuary. As referenced in the April 20, 2012 Technical Support Document entitled "Assessments of Aquatic Life Use Support in the Great Bay Estuary for Chlorophyll-a, Dissolved Oxygen, Water Clarity, Eelgrass Habitat and Nitrogen," water bodies that are part of the Great Bay estuary, including Great Bay itself, are experiencing degradation as a result of eutrophic conditions. This degradation has manifested itself in a number of ways, including loss of eelgrass (both cover and biomass) and a growing presence of algae. **3- 1**

In anticipation of arguments we expect to be raised by a small group of municipalities (i.e., the Great Bay Municipal Coalition ("Municipal Coalition"), consisting of the municipalities of Portsmouth, Dover, Rochester, Exeter and Newmarket), I am forwarding the attached document, which CLF recently sent EPA Administrator Lisa Jackson and EPA Inspector General Elkins. CLF appreciates the work NHDES has devoted to studying the problems facing the Great Bay estuary, including but not limited to its development of numeric translators of the State's water quality standards pertaining to nitrogen and the integrity of biological and aquatic communities. I ask that the enclosed materials be included in your record. I also direct your attention to Exhibit 13 of the enclosed letter, which consists of a report by two researchers with substantial expertise in estuarine ecology providing favorable opinions regarding NHDES's 2009 numeric nutrient translator analysis.

In anticipation of the Municipal Coalition's likely attack on the draft 2012 Section 303(d) list on the grounds that NHDES has not engaged in formal rule-making with respect to numeric nitrogen criteria, CLF notes that pursuant to 40 C.F.R. § 130.7 states are required to assemble and evaluate "all existing and readily available water quality-related data and information" for purposes of developing Section 303(d) impaired-waters lists. Failure to consider the analysis set forth in NHDES's 2009 numeric nutrient criteria, which considers multiple lines of evidence of eutrophication in the estuary, would violate that regulatory requirement and render New Hampshire's 2012 Section 303(d) list incomplete.

CLF appreciates the opportunity to provide these comments.

Very truly yours,

Thomas F. Irwin

Thomas F. Irwin
Vice President & CLF-New Hampshire Director

Enclosure: June 19, 2012 Correspondence from CLF to EPA Administrator Lisa Jackson and EPA Inspector General Arthur A. Elkins, Jr., including Exhibits 1 – 18.

COMMENT #4: David Green, Chief Operator WWTF, City of Rochester

City of Rochester, New Hampshire
PUBLIC WORKS DEPARTMENT
45 Old Dover Road • Rochester, NH 03867
(603) 332-4096 Fax (603) 335-4352

July 2, 2012

VIA U.S. FIRST CLASS MAIL& E-MAIL

2012, 303(d) Comments
Attention: Ken Edwardson
New Hampshire Department of Environmental Services
Watershed Management Bureau
29 Hazen Drive
Concord, NH 03302
E-mail: 303dcomment@des.state.nh.us

4- 1

RE: Request for Public Comment Regarding2012 Draft NH Section 303(d) List

Dear Mr. Edwardson:

The City of Rochester, NH, a community whose wastewater flows into the Great Bay Estuary, is directly impacted by the proposed 2012 Draft NH Section 303(d) impairment listings for the Cocheco River. The Cocheco River is listed on the draft 303(d) list as DO-impaired for Chlorophyll *a* and nitrogen. For the reasons stated below, we object to this impairment listing action as technically and legally flawed and request that the 2012 Draft NH 303(d) list be withdrawn or modified with respect to dissolved oxygen (DO) and nitrogen impairments specified for the Cocheco River. Specifically, we object to these impairment listings because DES based the Cocheco River's impairment designation on an assumption, rather than verified site-specific data showing a numeric DO water quality violation. This listing occurred even though various DO criteria were never exceeded at this same sample location (0 times out of the 55 times it exceeded the numeric DO criteria and the DO saturation limit was exceeded 0 times out of the 44 times). One does not use draft numeric objectives that have never been adopted into state law to override the results of adopted numeric criteria, 40 CFR 131.20. This plainly violates 40 CFR 130.6 requirements regarding the basis for impairment listing determinations. This also violated the state Administrative Procedures Act as the unadopted criteria are being applied as rules to declare these waters nutrient impaired.

The claimed DO: chlorophyll a relationship used to develop the nitrogen and chl a numeric objectives is a plainly flawed assessment. Several studies confirmed that the low DO in the systems used to generate the DO: chlorophyll a relationship contained in the 2009 Numeric Nutrient Criteria document did not occur as a function of the chlorophyll a level. See, Pennock (2005) – Lamprey **4- 2**

River; Jones (2007) – Squamscott River and HydroQual (2012) – Squamscott River. The Squamscott and Oyster River data, in particular, showed that low DO occurred when algal levels were low, not high. Thus, the relationship claimed to exist between minimum DO, nitrogen and elevated chlorophyll a is demonstrably incorrect and completely unreliable. **4- 3**

Moreover, the 2009 Numeric Nutrient Criteria were not developed using data from the Cocheco River, thus, there is no objective basis to claim that the relationship claimed to have been demonstrated by that document for other tidal rivers applies in the Cocheco River. Lastly, Mr. Trowbridge recently provided sworn testimony that the various factors affecting low DO in the tidal rivers had yet to be investigated. Other PREP reports indicated that low DO occurring in the various tidal rivers could be naturally occurring. Thus, one cannot presume that nitrogen is the cause of DO impairments even if they did exist in the Cocheco River. This claimed relationship is pure speculation at this time and speculation is not a basis for preparing a scientifically defensible 303(d) list. **4- 4**

The impairment assessment improperly ignores prior DES assessments of DO impacts associated with facilities on the Cocheco River. For example, the 1997 NPDES Permit Fact Sheet for the Cocheco River stated the following with regard to Rochester's facility:

> "Draft permit limits [for CBOD and total ammonia] developed from this model are sufficient to protect Class B NH Standards for DO in the receiving water after mixing with the effluent. That is, the combined effect of CBOD5 and Total Ammonia limits, on an average monthly basis, will not cause the DO in the Cocheco River to be less than a daily average of 75 percent of saturation, or, on a maximum daily basis, will not cause the DO to be less than an instantaneous minimum of at least 5.0 mg/L." **4- 5**

(1997 EPA NPDES Permit Fact Sheet for Cocheco River at 8.)

Despite this, DES has listed the Cocheco River as DO-impaired without data showing that the water body is, in fact, in violation of numeric DO criteria. DES may not simply ignore data showing numeric criteria compliance for DO in tidal rivers based on an assumed DO/Chlorophyll *a* relationship, as this would constitute an illegal use of surrogate criteria. Consequently, DES must remove all nitrogen-based and Chlorophyll *a*-based DO violations from the Cocheco River.

Thank you for your consideration of these comments. To the extent the City acquires further data or other information regarding the accuracy of the Section 303(d) list impairment designations, the City intends to supplement these preliminary comments as necessary. We look forward to the Department's response. **4- 6**

Sincerely,

David Green

David Green
Chief Operator WWTF

Enclosures
cc: Coalition Members

COMMENT # 5: Dean Peschel, Great Bay Municipal Coalition

GREAT BAY MUNICIPAL COALITION

July 2, 2012

VIA U.S. FIRST CLASS MAIL & E-MAIL

2012, 303(d) Comments
Attention: Ken Edwardson
New Hampshire Department of Environmental Services
Watershed Management Bureau
29 Hazen Drive
Concord, NH 03302
E-mail: 303dcomment@des.state.nh.us

5- 1

RE: Request for Public Comment Regarding 2012 Draft NH Section 303(d) List

Dear Mr. Edwardson:

The Great Bay Municipal Coalition ("the Coalition") is an organization dedicated to the establishment of appropriate and cost-effective restoration measures to protect Great Bay and its resources. The Coalition represents five major communities whose wastewater flows into various parts of the Great Bay system – Dover, Exeter, Newmarket, Portsmouth, and Rochester. These communities are directly impacted by the proposed 2012 Draft NH Section 303(d) impairment listings for the Great Bay Estuary. Attached please find comments and objections to the draft Section 303(d) list. These comments are provided on behalf of the Coalition and on behalf of the Coalition's individual members. The Coalition also previously provided DES with numerous documents, herein incorporated by reference, that discuss in greater detail the Coalition's reasons for its objections to the information upon which DES based its Section 303(d) impairment designations. *See* Attachment A.

As discussed further in the Coalition's attached comments, depositions of Dr. Fred Short (eelgrass expert), Mr. Paul Currier (DES official responsible for Great Bay regulatory issues), and Philip Trowbridge (lead technical analyst for Great Bay) were taken in May and June 2012 regarding the development and imposition of stringent nutrient limits in the Great Bay Estuary. *See* Attachments B (Excerpt of Transcript of F. Short Dep.) and C 5- 2

(Transcript of P. Currier Dep.) (Note: We just received the transcript of the P. Trowbridge deposition day one which was held on June 21st, and we will supplement the comments once his deposition is completed later in July. Initial statements from the Trowbridge transcript confirm that there is no reasonable basis to list waters as DO or eelgrass impaired for nutrients.) The *sworn* testimony from these individuals confirm there was no objective basis upon which to impose stringent total nitrogen (TN) reduction on Great Bay municipalities. The depositions further confirm that the narrative criteria violations were not demonstrated. Narrative criteria violations require a cause and effect relationship to be documented showing nutrients have caused excessive plant growth adversely impacting designed uses. However, the June 2009 Numeric Nutrient Criteria are not based on a demonstrated "cause and effect" relationship and do not constitute a demonstration that narrative criteria violations have occurred. In addition, the depositions confirmed that the cause of low dissolved oxygen (DO) conditions in the tidal rivers is unknown and has not been documented to be directly related to algal growth. Moreover, DES lacks studies on all of the tidal rivers evaluating the factors that affect the occurrence of low DO in these water bodies. **5- 3**

Based on this information, DES cannot claim the draft June 2009 Nutrient Criteria can be used to implement the narrative standard because it is not based on a demonstration of cause and effect. Secondly, the site-specific information available for the Estuary does not show, in Great Bay or the tidal rivers, that nitrogen has any significant effect on transparency levels or that changing transparency was in fact the cause of eelgrass loss anywhere in the system. Moreover, it is improper to claim that nitrogen or algal levels were the cause of DO violations anywhere in the tidal rivers. **5- 4**

For the reasons above and those provided in the attached comments, the Coalition objects to this impairment listing action as technically and legally flawed and requests that the 2012 draft NH 303(d) list be withdrawn or modified with respect to eelgrass and dissolved oxygen (DO) impairments specified for the Estuary as follows: **5- 5**

1. Remove all DO-based Chlorophyll "a" violations and DO-based nitrogen violations.

2. Remove all nitrogen-caused transparency exceedances related to eelgrass. **5- 6**

3. Transparency should be eliminated as a cause of impairment in Great Bay, Little Bay, the Upper Piscataqua River, Lamprey River, and the Squamscott River. **5- 7**

4. The designation of eelgrass loss as an impairment in the Squamscott, Lamprey, and Upper Piscataqua Rivers should be eliminated because it appears to be the result of a natural condition caused by elevated levels of color. **5- 8**

5. Decreased transparency related to natural causes should be noted to be natural in origin and may not be considered an impairment and thus a violation of the narrative criteria. **5- 9**

GREAT BAY MUNICIPAL COALITION

Lastly, to the extent the Coalition acquires further data or other information regarding the accuracy of the Section 303(d) list impairment designations, the Coalition intends to supplement these preliminary comments as necessary.

Thank you for your consideration of these comments. We look forward to the Department's response. **5- 10**

Sincerely,

Dean Peschel

Enclosures

cc: Coalition Members

Great Bay Municipal Coalition
Comments on Draft NH 2012 303(d) List of Impairments

The Great Bay Municipal Coalition (the Coalition) is an organization dedicated to the establishment of appropriate and cost-effective restoration measures to protect Great Bay and its resources. The Coalition members include the cities and towns of Dover, Exeter, Newmarket, Portsmouth, and Rochester, NH. These communities are directly affected by the Draft NH 2012 303(d) List of Impairments. For the reasons stated below, we object to this impairment listing action as technically and legally flawed and request that the 2012 Draft NH 303(d) list be withdrawn or modified with respect to eelgrass and dissolved oxygen (DO) impairments specified for the Great Bay Estuary. **5- 11**

A. Statutory and Regulatory Requirements Governing Section 303(d) Listing Determinations

Under the Clean Water Act, the State has the primary responsibility for compiling a list of water bodies on a pollutant-by-pollutant basis that do not support their designated uses. 33 U.S.C. §1313(d)(1)(A). In compiling this list, "EPA regulations require states to "assemble and *evaluate all* existing and readily available water quality-related data and information to develop [their impaired water lists]. 40 CFR § 130.7(b)(5) (emphasis added)." At the very minimum, an evaluation is required of the site-specific information available for a given waterbody. *See Sierra Club v. EPA,* 488 F.3d 904, 916 (11th Cir. 2007) ("We therefore uphold that EPA's decision that Florida was required to consider only waterbody-specific data in developing its 2002 List."). **5- 12**

Even if a state or EPA originally lists a water body as impaired, it is free to subsequently modify its original listing. There is nothing that prevents an agency from removing the water body from the State's impaired list or "de-listing" a water for a particular pollutant. *See Sierra Club, Inc. v. Leavitt,* 393 F. Supp. 2d 1263, 1266 (N.D. Fla. 2005) ("The EPA can approve a list in whole or in part, add waters it finds to be impaired, and remove ("delist") waters it finds to meet acceptable standards."); *Thomas v. EPA,* 2007 U.S. Dist. LEXIS 92201 (N.D. Iowa Dec. 17, 2007) (EPA did not act arbitrarily or capriciously by allowing a state to de-list a water body because the original listing lacked "water quality data or water quality criteria upon which to base an assessment of the aquatic life uses" for the water body.) **5- 13**

When a state removes a water body from the impaired list for a particular pollutant, EPA regulations simply require that the State "provide documentation to the Regional Administrator to support the State's determination to list or not to list its waters ..." 40 CFR § 130.7(b)(6). In making this presentation to EPA, a state is required to show good cause for its decision not to include a water on the list. This "good cause" standard "includes, but is not limited to, more recent or accurate data; more sophisticated water quality modeling; flaws in the original analysis that led to the water being listed in the categories in § 130.7(b)(5); or changes in conditions, e.g., new control equipment, or elimination of discharges." 40 CFR § 130.7(b)(6)(iv). **5- 14**

B. National Guidelines Principles Governing Numeric Criteria Development

In determining whether to list a water body as impaired, the State is to apply the applicable state water quality criteria. 40 C.F.R. Parts 130 and 131. Pursuant to Clean Water Act (CWA) Section 303(c) and its implementing regulations at 40 C.F.R. Part 131, state water quality criteria are set at the level "necessary to protect the [designated] uses." 40 C.F.R. 131.2. Criteria also must be based on "sound scientific rationale." 40 C.F.R. 131.11(a). Numeric criteria should be based on EPA's Section 304(a) guidance, modified to reflect site-specific conditions, or "other scientifically defensible methods." 40 C.F.R. 131.11(b). In addition, narrative criteria may be established where numeric criteria cannot in order to supplement numeric criteria. *Id.* Thus, it is axiomatic that approvable criteria must be set at the level that is demonstrated to be both necessary and appropriate for protecting a particular aquatic use (*i.e.*, fishery or human health protection).[1] **5- 15**

EPA has had long-standing published procedures for developing water quality criteria. *See Guidelines for Deriving Numerical National Water Quality Criteria for the Protection of Aquatic Organisms and Their Uses*, USEPA 1985 (hereafter "*National Guidelines*"). EPA's *National Guidelines* establish the threshold principles that all aquatic water quality criteria must meet to be considered "scientifically defensible." First, the purpose of criteria is to protect aquatic organisms and their uses from unacceptable effects. *See National Guidelines*, at vi. "Criteria should attempt to provide a reasonable and adequate amount of protection with only a small possibility of considerable overprotection or underprotection." *National Guidelines*, at 5. Proper criteria derivation requires the establishment of a "cause and effect" relationship to ensure that regulation of the pollutant is necessary and will produce the desired effect. *National Guidelines*, at 15-16, 21. Thus, "[t]he concentrations, durations, and frequencies specified in criteria are based on biological, ecological, and toxicological data, and are designed to protect aquatic organisms and their uses from unacceptable effects." *Id.* at 16. To develop such criteria, adequate data must be available or the criteria should not be developed. *Id.* at 5-6. Specifically, there must be adequate data on pollutant levels that cause an unacceptable adverse effect on any of the specified biological measurements. *Id.* at 39. For materials that have a threshold effect (like nutrients), the threshold of unacceptable effect must be determined. *Id.* at 8. In addition, a "[c]riterion must be used in a manner that is consistent with the way in which [it was] derived...." *Id.* at 7.

EPA has also provided additional background documentation regarding what should constitute an acceptable "weight of evidence" approach used in criteria development. *See Using Field Data and Weight of Evidence to Develop Water Quality Criteria*, Cormier et al., 2008 SETAC. That document,

[1] *See, e.g., Thomas v. Jackson*, 581 F.3d 658, 661 (8th Cir. 2009) ("The water quality standards comprise: (1) designated uses; (2) water quality criteria *defining the amounts of pollutants that the water can contain without impairment of the designated uses*; and (3) anti-degradation requirements, which apply to bodies of water whose quality is better than required.") (emphasis supplied); *Natural Resources Defense Council v. USEPA*, 915 F.2d 1314, 1317 (9th Cir. 1990) ("Second, the state was to determine the "criteria" for each segment - *the maximum concentrations of pollutants that could occur without jeopardizing the use*. These criteria could be either numerical (e.g. 5 milligrams per liter) or narrative (e.g. no toxics in toxic amounts)") (emphasis supplied); *American Wildlands v. Browner*, 94 F. Supp. 2d 1150, 1154 (D. Colo. 2000) ("The second area is "criteria for all toxic pollutants" which articulates the amounts of various pollutants that may be present in the water without interfering with the designated uses. 33 U.S.C. § 1313(c)(2)."); *MCEA v. EPA*, 2005 U.S. Dist. LEXIS 12652, *14 (D. Minn. Jun. 23, 2005) (emphasis added) ("When establishing a water quality standard or water quality criterion, it is axiomatic that the standard is set at a *level necessary to protect the designated uses*.").

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prepared by EPA's Office of Research and Development, specifies the following with respect to criteria derivation:

> *Development of numeric WQC is based on 3 basic assumptions: First, causal relationships exist between agents and environmental effects. Second, these causal relationships can be quantitatively modeled. Finally, if exposures to the causal agent remain within a range predicted by the quantitative model, unacceptable [e]ffects will not occur and designated uses will be safeguarded. Therefore, for criteria to be valid there must be evidence that the criteria are based on reasonably consistent and scientifically defensible causal relationships.*

Consistent with the *National Guidelines'* requirement that a criteria development document provide a clear demonstration of causation, the various EPA nutrient criteria documents for estuary, lake, and stream environments all clearly specify that dose/response demonstrations and identifiable impairment thresholds are required to set scientifically defensible nutrient standards. For instance, the *Nutrient Criteria Technical Guidance Manual – Rivers and Streams*, USEPA July 2000 (hereafter "*Rivers and Streams Document*") is clear that a nutrient criterion must be based on a demonstration that nutrients are causing excessive plant growth (eutrophication), measured by chlorophyll 'a'. ("Nutrient criteria development should relate nutrient concentrations in streams, algal biomass and changes in ecological condition (*e.g.*, nuisance algae accrual rate and deoxygenation.... Initial criteria should be verified and calibrated by comparing criteria in the system of study to nutrients, chlorophyll 'a', and turbidity values in water bodies of known condition to ensure that the system of interest operates as expected.") *Rivers and Streams Document* at 13. Additionally, the *Rivers and Streams Document* stressed that the targeted instream objective must be related back to an impairment threshold. *Id.* at 76 ("Predictive relationships between nutrients and periphyton (or phytoplankton) biomass are *required* to identify the critical or threshold concentrations that produce nuisance algal biomass.") (emphasis supplied). **5- 17**

C. State Narrative Criteria Require a Demonstration of a Cause and Effect Relationship to Conclude a Violation Exists

The New Hampshire Department of Environmental Science (DES) included the disputed impairment listings for the Great Bay Estuary based upon application of the still-unadopted 2009 numeric nutrient criteria for the Great Bay Estuary (June, 2009), concluding that nitrogen reduction was necessary to restore eelgrass beds to their historical levels and to mitigate dissolved oxygen criteria excursions in the tidal rivers. These findings are without merit, as confirmed by numerous reports and evaluations presented by the Coalition over the last two years. These reports, including some prepared by DES itself, confirm that total nitrogen (TN)/algal chlorophyll-a is not causing dissolved oxygen criteria exceedances in the tidal rivers and that phytoplankton chlorophyll-a concentrations have not changed significantly nor does it materially influence water clarity in Great Bay and the Harbor. Moreover, the listings for the Great Bay Estuary are bases on a revised interpretation of the Department's narrative standard, wherein a demonstration of causation is no longer required and bio-impairment for eelgrass is merely assumed if current eelgrass cover differs from historical levels, even if habitat changes preclude eelgrass from occupying areas in the tidal rivers. Consistent with the *National Guidelines*, a demonstration of a cause and effect relationship is required to conclude that a violation of the narrative standard, listed at Env-Wq 1703.14, has occurred. (*See* Env-Wq 1703.14.) The information presented below summarizes the detailed reports and evaluations, previously provided to the Department, demonstrating that its basis for listing the estuary as impaired and requiring significant reduction in total nitrogen load is misplaced. **5- 18**

II. EVALUATION OF DRAFT 2012 NH 303(d) LIST OF IMPAIRMENTS

A. Sworn Testimony Confirms No Objective Basis to Conclude the Total Nitrogen Caused Narrative Criteria or Dissolved Oxygen Violations

In May and June, 2012, depositions were taken of Dr. Fred Short (eelgrass expert), Mr. Paul Currier (DES official responsible for Great Bay regulatory issues), and Philip Trowbridge (lead technical analyst for Great Bay). (*See* Attachments B (Excerpts from Transcript of Deposition of F. Short) and C (Transcript of Deposition of P. Currier).[2] The *sworn* testimony from these individuals confirms the following: **5- 19**

<u>**Cause of Eelgrass Population Changes is Unknown**</u>

1. Dr. Short never determined the cause of the changing eelgrass population levels in Great Bay or any of the tidal rivers, and DES lacks studies demonstrating such cause. (*See* Short Dep.) **5- 20**

2. On Piscataqua River, eelgrass were first declining (2003-2007) where water quality was the best (Harbor mouth) and then moved to upstream areas. Why this occurred is unknown. (*See* Short Dep.) **5- 21**

3. Water quality and nutrient loading conditions occurring prior to 2000 were sufficient to protect eelgrass resources. (*See* Short Dep.) **5- 22**

Great Bay Does Not and Never Has Had a Transparency Problem

4. Great Bay is not a transparency-controlled system with regard to eelgrass; eelgrasses receive sufficient light due to the tidal variation in the system. (*See* Short Dep.; Trowbridge Dep.) **5- 23**

Nitrogen Increases Have Not Caused Excessive Plant Growth or Any Change in Transparency Adversely Impacting Eelgrass

5. A major increase (59%) in nitrogen concentration occurring since 1980 *did not* cause any significant change in algal growth in the Bay or tidal rivers. (*See* Short Dep.; Trowbridge Dep.; Currier Dep.) **5- 24**

6. Eelgrass populations thrived from 1990 through 2001 under the elevated TN conditions and existing transparency conditions in Great Bay and Piscataqua River. (*See* Short Dep.) **5- 25**

7. Transparency in Great Bay and Piscataqua River was documented to be unchanged by Philip Trowbridge from 2000 through 2007 when eelgrass populations apparently declined. This analysis was presented at a March 2008 eelgrass conference hosted by EPA Region I. (*See* Trowbridge Dep.; Currier Dep.) **5- 26**

8. Algal growth is not demonstrated to be a significant factor affecting transparency anywhere in the system. (*See* Short Dep.) **5- 27**

9. Colored dissolved organic matter, a naturally occurring condition, has the greatest influence on light transmission throughout the system. Color originates from the watersheds of the tidal rivers. (*See* Trowbridge Dep.) **5- 28**

10. Federally funded research (2008- Morrison) on Great Bay confirmed that (1) existing light conditions were sufficient for eelgrass growth (2) changes in eelgrass populations are not related to transparency and (3) other causes require investigation. (*See* Trowbridge Dep.; Currier Dep.) **5- 29**

Narrative Criteria Violations Not Demonstrated

11. Narrative criteria violations require a cause and effect relationship to be documented showing nutrients have caused excessive plant growth adversely impacting designed uses. *See* Currier Dep.) **5- 30**

12. The June 2009 Numeric Nutrient Criteria are not based on a demonstrated "cause and effect" relationship and do not constitute a demonstration that narrative criteria violations have occurred. (*See* Short Dep.; Trowbridge Dep.; Currier Dep.) **5- 31**

Application of 2009 Numeric Criteria in Tidal Rivers Unsupported

13. Previous studies from Dr. Short confirmed that the Squamscott/Lamprey Rivers are not suitable for eelgrass restoration, he never advised on the ability to achieve better water clarity in these rivers and he never recommended applying a 0.3 mg/l TN standard in these rivers to ensure eelgrass restoration. (*See* Short Dep.) **5- 32**

Cause of Macroalgae Growth Unknown

14. Increased macroalgae growth occurred only recently (after 2005) in Great Bay and is not demonstrated to be caused by changing nutrient levels. State estimated less restrictive TN reductions could possibly reduce macroalgae growth (~8 mg/l TN limit). (*See* Trowbridge Dep.; Short Dep.) **5- 33**

15. Existing macroalgae growth is not demonstrated to be preventing eelgrass restoration in Great Bay (most growth occurs on tidal flats that don't support eelgrass). (*See* Trowbridge Dep.; Short Dep.) **5- 34**

Eelgrass Restoration Occurring Under Existing Conditions

16. Little Bay has recently experienced significant eelgrass regrowth (> levels present in 1996) even though transparency and nutrient levels are worse than those recommended in the June 2009 Numeric Criteria document. (*See* Trowbridge Dep.; Short Dep.) **5- 35**

17. Continued survival and regrowth of eelgrass in Little Bay means compliance with 2009 Numeric Nutrient Criteria is not justified. (*See* Trowbridge Dep.; Currier Dep.) **5- 36**

EPA Said Apply the Unadopted 2009 Criteria in the Regulatory Process

18. DES planned to formally adopt the 2009 Criteria in 2010 after conducting an external peer review. Following a threatened suit by CLF, EPA called DES, indicated that numeric criteria could be used immediately and that the criteria be called a "narrative implementation method." (*See* Currier Dep.) **5- 37**

Cause of Low DO Conditions in the Tidal Rivers is Unknown

19. The causes of low DO conditions in all of the tidal rivers are unknown and not documented to be directly related to algal growth. (*See* Trowbridge Dep.) **5- 38**

20. DES lacks studies on all tidal rivers evaluating the factors that affect the occurrence of low DO in these water bodies. (*See* Trowbridge Dep.) **5- 39**

As such, this deposition testimony confirms that there was no rational, objective, scientific basis upon which to impose stringent TN reduction on Great Bay municipalities. Consequently, the Draft NH 2012 Section 303(d) list must be extensively revised to reflect this fact. **5- 40**

The following additional information confirms that the statements made in these depositions are adequately supported and further justifies that the Draft NH 2012 Section 303(d) List must be significantly revised.

B. DES Illegally Changed the Interpretation of Its Narrative Standard from Requiring a Demonstration of Cause and Effect to a Weight of Evidence Analysis

Consistent with the *National Guidelines*, DES has historically required the demonstration of a cause and effect relationship in order to conclude that a violation of the narrative standard, listed at Env-Wq 1703.14, has occurred. However, DES recently changed its interpretation of its narrative standard to merely require a "weight of evidence" analysis prior to concluding a violation has occurred. It has come to the attention of the Coalition that DES' use of the term "weight of evidence" is not synonymous with "cause and effect" but rather a vague approach by which DES claims it does not need to make a cause and effect demonstration in order to conclude that a violation has occurred. By switching from requiring a demonstration of cause and effect to solely a weight of evidence analysis, DES has in fact amended the interpretation of its narrative criteria without first undergoing proper rulemaking procedures, as is required by the Clean Water Act and the Administrative Procedure Act. Consequently, this new interpretation which substantively amends the application of the criteria must be stricken and undergo the proper administrative procedures before implementation. **5- 41**

C. DES Applied Unadopted and Thereby Inapplicable Criteria to Develop Section 303(d) Listings

DES is required to apply only properly adopted criteria in the development of Section 303(d) impairment listings. To the contrary, DES applied an un-adopted and un-proposed numeric nutrient value to develop the 2012 draft NH 303(d) impairment listings, without undertaking the formal adoption process required by state and federal law. The Clean Water Act (CWA) and implementing statutes mandate that state water quality standards (WQS), including new narrative criteria interpretation approaches, undergo a public review and adoption process BEFORE being used in the regulatory process pursuant to EPA's "Alaska rule."[3] This also applies to new narrative translator procedures used in impairment listing decisions. (*See* United States Environmental Protection Agency Determination on Referral Regarding Florida Administrative Code Chapter 62-303, Identification of Impaired Surface Waters, July 6, 2005, EPA Florida Determination at 9 ("Provisions that affect attainment decisions made by the State and that define, change, or establish the level of protection to be applied in those attainment decisions affect existing standards implemented under section 303(c) of the Act. These provisions constitute new or revised water 5- 42

[3] Criteria, regardless of whether they are narrative or numeric, must be vetted through a thorough public notice and comment process. *See* 40 C.F.R. § 131.13; 40 C.F.R. § 131.20(a), (b), and (c).

quality standards."). Failure of the State to undertake this process has violated federal law, state law, and the due process rights of the communities and individuals affected by the proposed numeric nutrient criteria. The communities must be afforded the opportunity to submit comments within the designated standard adoption process and appeal, if appropriate, this rule adoption action, before such standard can be considered an "applicable standard" for Section 303(d) listing purposes.

Moreover, unadopted numeric criteria may *not* be deferred and implemented as a narrative standard. *See* EPA's "Alaska Rule" governing adoption and modification of state water quality standards – 40 C.F.R. § 131.21, 65 Fed. Reg. 24641, 24647 (April 27, 2000) ("During the adoption of the detailed procedures, all stakeholders and EPA have an opportunity to make sure that important technical issues or concerns are adequately addressed in the procedures. *** This approach is particularly useful for criteria which are heavily influenced by site-specific factors such as nutrient criteria or sediment guidelines. Such procedures must include a public participation step to provide all stake-holders and the public an opportunity to review the data and calculations supporting the site-specific application of the implementation procedures."); U.S. Environmental Protection Agency, Water Quality Standards Handbook, Second Edition, EPA 823-9-94-005a (August 1994), available at http://water.epa.gov/scitech/swguidance/standards/handbook/index.cf, at 3-22 ("Where a State elects to supplement its narrative criterion with an accompanying 5- 43
implementing procedure, it *must formally* adopt such a procedure as a part of its water quality standards. The procedure *must* be used by the State to calculate derived numeric criteria that will be used as the basis for all standards' purposes, including the following: *developing TMDLs*, WLAs, and limits in NPDES permits . . . .") (emphasis added); *id.* at 3-22 ("To be consistent with the requirements of the Act, the State's procedures to be applied to the narrative criterion *must* be submitted to EPA for review and approval, and will become a part of the State's water quality standards. (*See* 40 C.F.R. § 131.21 for further discussion.)") (emphasis added); *id.* at 3-24 ("Where a State plans to adopt a procedure to be applied to the narrative criterion, it *must* provide full opportunity for public participation in the development and adoption of the procedure as part of the State's water quality standards.") (emphasis added). DES has acknowledged numerous times that the criteria are intended to be adopted by the State as numeric, not narrative, criteria. *See* Ex. 1 – Numeric Nutrient Criteria for the Great Bay Estuary (June, 2009).

D. DES Must Use Scientifically Accepted Methods for Criteria Derivation and 303(d) Impairment Assessment

All Section 303(d) listings must be based on scientifically reliable analyses. To the contrary, DES used scientifically indefensible methods in the derivation of water quality criteria (June 2009 Numeric Nutrient Criteria) and the development of the draft 2012 Section 303(d) impairment listings. The methods utilized by DES for deriving a relationship between DO and Chl a and a relationship between transparency and total nitrogen were expressly stated by the EPA's Science Advisory Board to be improper and not scientifically defensible. Consequently, all impairment listing determinations that rely on the unadopted 2009 Numeric Nutrient Criteria must be withdrawn. **5- 44**

1. DES Failed to Base Section 303(d) Listings on Site-Specific Data Confirming the Criteria are Being Violated

DES failed to base the draft 2012 Section 303(d) impairment listings on site-specific data that confirmed that the properly applicable criteria were being violated. Throughout 2011 and 2012, the Coalition communities repeatedly presented data and analyses to DES confirming that transparency reductions associated with TN *cannot* be the cause of the eelgrass declines and that TN-induced impacts on transparency (i.e., increased algal growth) are documented to be negligible. *See, e.g.,* Exs. 2, 3, and 4 – Transparency-phytoplankton relationship charts for the Squamscott, Lamprey, and Piscataqua Rivers. The Coalition also reconfirmed that the transparency in the tidal rivers was quite low due to natural factors (color, turbidity, etc.) and, due to these factors, apparently could no longer support eelgrass growth based on the degree of light penetration presumed by DES to be necessary to support such growth. *See id.* Despite this information, DES continued to list these water bodies as having eelgrass impairments caused by nitrogen. **5- 45**

2. DES Failed to Demonstrate Cause and Effect and Consider Confounding and Covarying Factors in Identifying Impairments

DES failed to demonstrate a scientifically defensible cause and effect relationship that took into consideration confounding and covarying factors in the development of the draft 2012 Section 303(d) list and identified impairments based on assumed relationships between DO and Chl a and between transparency and TN. The USEPA Science Advisory Board has indicated that the type of "cause and effect" relationships developed by DES in 2009 cannot be presumed from such simplified analyses and that other factors that co-vary and may otherwise explain the change in the measured response variable must be assessed. (*See* "Review of Empirical Approaches to Nutrient Criteria Derivation," April 28, 2010.) The narrative criterion was based on a stressor-response evaluation between median light attenuation coefficient and median nitrogen concentration, as described in the Numeric Nutrient Criteria for the Great Bay Estuary. (Ex. 1 - DES, June 2009 at 67.) This stressor-response analysis is inconsistent with current EPA guidance on use of stressor-response analysis to develop numeric nutrient criteria.[4] This EPA guidance is explicit with regard to the use of simple linear regression for the derivation of numeric nutrient criteria. This method cannot be used without a demonstration of "cause and effect," confounding, and co-varying factors must be carefully considered, and the response must be biologically significant. Without a mechanistic understanding and a clear causative link between nutrient levels and impairment, there is no assurance that managing for particular nutrient levels [based on linear regression analysis] will lead to the desired outcome. (*See* SAB's *Review of Empirical Approaches for Nutrient Criteria Derivation*, April 27, 2010, at 6 ("Without a mechanistic understanding and a clear causative link between nutrient levels and impairment, there is no assurance that managing for particular nutrient levels will lead to the desired outcome."); *id.* at 38 ("Large uncertainties in the stressor-response relationship and the fact that causation is neither directly addressed nor documented indicate that the stressor-response approach using empirical data cannot be used in isolation to develop technically defensible water quality criteria that will protect against environmental degradation by nutrients.").) Narrative criteria implementation requires site-specific data showing that the pollutant of concern is the cause of the use impairment. There are no such data for several of the tidal rivers and, to the degree the issues have been analyzed by local experts, those analyses have confirmed that nitrogen is *not* the cause of the impairments EPA is intending to address. (*See, e.g.*, Jones et al., *Impacts of Wastewater Treatment Facilities on Receiving Water Quality* (April 2007) (New Hampshire Estuary Project Report).) It is not scientifically defensible to plot data from such different areas on a single graph and conclude that the dependent pollutant caused the system response when other major physical and chemical factors are known to affect the result and have not been considered in the analysis. DES plotted areas with radically different physical and chemical conditions and presumed that the level of TN occurring in the different areas was the only parameter controlling changes in DO, transparency, or algal growth. (*See* Ex. 5.) The method used to derive the DO-based TN objectives was derived similarly. **5- 46**

[4] Using Stressor-response Relationships to Derive Numeric Nutrient Criteria. USEPA. November 2010. EPA-820-S-10-001.

The SAB has also cautioned that only data taken from similar habitats should be used for stressor-response analyses. (*See* Using Stressor-response Relationships to Derive Numeric Nutrient Criteria. USEPA. November 2010. EPA-820-S-10-001.) None of these factors or changing conditions were considered by DES in the evaluation of the system response to nutrient inputs. Dilution alone can explain the majority of the relationship between TN and all of the parameters plotted that were claimed to be caused by changes in TN. (*See* Ex. 6.) Moreover, HydroQual confirmed that, for transparency, turbidity co-varied with nitrogen levels and also explained the change in transparency throughout the Great Bay system. (*See* Ex. 7.) Nitrogen does not relate directly to "turbidity" that is caused by a number of physical processes unrelated to the ambient nutrient concentration. Other parameters such as TSS, salinity, dissolved organic matter, color, SOD, phosphorus, and a host of other parameters also co-vary with TN and DO levels. (*See, e.g.*, Exs. 6, 7, and 8.) Unless these factors are considered and it is confirmed that TN caused excessive plant growth, which in turn controlled the endpoint of concern (low DO or decreased transparency), there is no basis to conclude that TN was the cause of the changes occurring in DO or transparency throughout the system. This is a seriously flawed analysis, as the basic physical and chemical parameters influencing the pollutant levels and resultant water quality were not addressed in the DES assessment. This fundamentally flawed assessment methodology cannot be relied upon to demonstrate that TN reduction is necessary to protect the Bay or that the particular ambient TN level selected by DES will be sufficient to restore use impairments of concern. **5- 47**

Moreover, EPA Region I conducted an internal review of the June 2009 Numeric Nutrient Criteria document following submission of the Coalition's technical comments and EPA's SAB Report. (*See* Ex. 9 - M. Liebman, EPA Region I, document titled "Review of: Numeric Nutrient Criteria for the Great Bay Estuary, in light of comments made by John C. Hall and Thomas Gallagher (2010)" dated September 1, 2010.)[5] This internal analysis confirmed the Coalition's observation that numerous scientific deficiencies underlie the June 2009 Criteria document, including the following: **5- 48**

[5] This document was provided to the Coalition by Region I in response to FOIA Request No. 01-FOI-00148-11.

Conceptual models

"They rely on literature and only sparingly rely on established results from the estuary itself. It would be better to document some of the connections within the estuary itself." [Ex. 9 at 2.] **5- 49**

Algal blooms

"The correlations between total nitrogen and 90th percentile chlorophyll *a* levels by assessment unit or by trend monitoring station are strong, but does this discount other factors, such as salinity and wind, or stratification? ... Is there supporting information to suggest that the chlorophyll *a* levels observed in the estuary are consistent with a response from the measured or estimated nutrient loading to the estuary?" [Ex. 9 at 2.] **5- 50**

Macroalgae

"The conceptual model is that as TN increases, eelgrass is replaced by macroalgae, but the actual mechanism is not sufficiently explained. Are macroalgae better able to utilize nutrients in enriched conditions and thus outcompete eelgrass? Are there any literature or mesocosm experiments in Great Bay that document this? There is literature from Waquoit Bay, but is this area similar enough to Great Bay to explain the process?" [Ex. 9 at 3.] **5- 51**

"Although there does seem to be supporting evidence of this replacement based on one aerial survey, there is insufficient documentation of the loss of eelgrass and coincident replacement by macroalgae." [Ex. 9 at 3.] **5- 52**

Light extinction

"On page 15, the authors state that eelgrass is sensitive to water clarity without citing the specific experimental evidence in the Great Bay estuary. ... For example, do the mesocosm experiments show the effects of increasing nitrogen enrichment on eelgrass in terms of light attenuation, or lengthening of blades, or loss of carbohydrate stores, or epiphytic growth? Are these loadings similar to loadings into Great Bay and are the responses in Great Bay expected based on the mesocosm experiments?" [Ex. 9 at 3.] **5- 53**

Confounding factors

Chlorophyll a

"The authors did not sufficiently evaluate whether salinity is more important than nitrogen in controlling phytoplankton abundance. ... Does chlorophyll *a* track salinity as well? ... This would provide supporting material to document that the chlorophyll *a* response is controlled primarily by nutrients, rather than habitat changes (i.e. low salinity vs. higher salinity zones)." [Ex. 9 at 3-4.] **5- 54**

Benthic indicators

"The authors state (on page 40) that organic matter comes from primary producers, but they don't evaluate the effect of organic matter from terrestrial sources, especially in the upper parts of the estuary. On page 41, they state that the regressions prove that total organic carbon in sediments is associated with nitrogen and chlorophyll *a* concentrations in the water column, but they don't say that they are caused by them. I suspect that terrestrial sources from nonpoint and sewage treatment effluent are more important than autotrophic sources of organic matter." [Ex. 9 at 4.] **5- 55**

Dissolved oxygen

"The dissolved oxygen section on page 45 presents an incomplete conceptual model, because they do not address other sources of organic matter, including sewage treatment effluent, and terrestrial runoff. ... In addition, the relationships could be confounded by salinity stratification, or flushing, rather than nitrogen. The sonde data sources for low dissolved oxygen are all in the tributaries, which are really different than the Great Bay areas, and therefore the low dissolved oxygen could be partly related to poor circulation and salinity wedges and other sources of organic matter (e.g. terrestrial organic matter). Additional information should be presented to discount these other factors." [Ex. 9 at 4.] **5- 56**

Light extinction

"On page 63 and in Figure 34 the authors suggest that the particulate organic matter in the water column expressed as turbidity is caused by nitrogen and that this particulate matter is autochthonous (i.e. derived from phytoplankton). But, there should be supplemental evidence that discounts the possibility that this organic matter is related to the salinity gradient and is from upstream sources of terrestrial runoff." [Ex. 9 at 5.] **5- 57**

Both the SAB Report and the final Guidance confirm that the use of stressor-response analyses are only scientifically defensible when cause and effect has been demonstrated and significant confounding factors influencing the stressor-response relationship have been accounted for in the analysis. *Id.* at 6. The June 2009 Criteria did not address either of these fundamental considerations, rendering the criteria as an unreliable "translator." Due to the obvious, significant technical deficiencies and failure to provide analyses consistent with the SAB recommendations, DES may not claim that the unadopted numeric criteria and 303(d) list implementing these criteria are scientifically defensible and accurately predict impairments or their causes. As such, the draft 2012 Section 303(d) list must be amended to remove all impairments based on these flawed analyses and assumed relationships. **5- 58**

3. Site-Specific Data from the Great Bay Estuary Confirms TN Criteria are Miscalculated, as Transparency is Not Controlled by N or Algal Growth in the Tidal Rivers

The Coalition and other entities have provided DES with site-specific information and analyses from the Great Bay Estuary demonstrating that the June 2009 Numeric Nutrient Criteria have been miscalculated because transparency is neither controlled by nitrogen nor algal growth in the tidal rivers. One such analyses was performed by the New Hampshire Estuaries Project (NHEP) (a federally-funded state project), which formed a Technical Advisory Committee (TAC) in September 2005 to address the development of appropriate numeric water quality standards for the Estuary. The TAC members included EPA Region I, New Hampshire Department of Environmental Services (DES), University of New Hampshire (UNH) professors, municipal representatives, the Conservation Law Foundation (CLF), and a number of environmental consultants. Detailed site-specific research was conducted on the factors influencing the ecology of the Estuary and in particular the effect of nutrient concentrations on both the tidal rivers and Great Bay. Over the course of several meetings from 2006 to 2008, the TAC evaluated the results of these detailed studies, reaching the following scientific consensus: 5- 59

(1) The classic model of eelgrass loss due to TN-induced transparency decrease is inapplicable to Great Bay because transparency reduction was not the cause of the eelgrass losses and there is minimal phytoplankton growth in Bay and Piscataqua River due to physical characteristics of those waters; 5- 60

(2) Increasing total inorganic nitrogen (TIN) levels since the 1980s did not significantly increase algal blooms; 5- 61

(3) The main factor controlling transparency in Great Bay [and tidal rivers] is color and turbidity from the tidal rivers (algal levels in the Bay are low and only account for 8% of the light extinction in Bay waters); 5- 62

(4) Using data from other estuaries (i.e., Chesapeake Bay) to set Great Bay standards is not appropriate due to significant physical differences (eelgrass in Great Bay apparently tolerate higher TN loadings than other estuaries due to short retention times); 5- 63

(5) It should not be presumed that TN is the cause of eelgrass losses; analyses that combine data from different areas of the Estuary to justify a TN/transparency connection do not prove causation and may be misleading; and 5- 64

(6) DES should not claim eelgrass impairments exist in the tidal rivers (e.g., Squamscott River) if the area in question is no longer suitable for eelgrass growth [several tidal rivers exhibit naturally low transparency]. 5- 65

Moreover, the historical data evaluations presented for Great Bay confirm that average algal growth increases have been slight and therefore could not have been the underlying cause of eelgrass decline occurring throughout the system. The PREP Environmental Indicators Report - 2009 shows that from 1993-2000 chlorophyll a levels did not increase and averaged about 2.5 ug/l. (*See* 2009 PREP Report, Figure NUT3-5.) This was also confirmed by time series analysis of the data. (*See* Ex. 11.) Therefore, algal growth induced transparency decreased and could not have played any role in eelgrass declines during this period, as EPA has assumed. This same PREP Report figure shows that algal levels increased by about 1 μg/l from 2001-2008. These are very low levels of primary productivity and minor changes in average system productivity that produced trivial changes in light penetration. Such algal growth in the Bay was demonstrated by Morrison to be a minor component affecting transparency. (*See* 2009 DES Report at 61; Ex. 12.) EPA's peer review also noted that the Great Bay did not exhibit substantial algal growth and that, therefore, limited transparency benefits could be obtained by attempting to reduce algal growth in the Bay. 5- 66

Data on chlorophyll *a* levels and secchi depth, not originally considered by DES when issuing the 2009 draft numeric criteria document, confirm that transparency did not materially change in Great Bay during the period of eelgrass reduction and that chlorophyll *a* increases are not associated with eelgrass decline. (*See* Ex. 11.) These data confirm that transparency was not a causative agent in the eelgrass decline of the 1990s and that, in fact, transparency appears better today than during the mid-1990s. Moreover, the data further support the conclusion that transparency (as measured by secchi depth) is not materially affected by the chlorophyll *a* level in this system, as Morrison had also determined. Comparing EPA's Figure 5 – Gradient of Light Attenuation with Figure 4 – Gradient of Chlorophyll *a* confirms that median transparency has little to do with algal growth; therefore, controlling TN levels to control algal growth will have no material impact on water column transparency. The data cited by the Region in support of its actions show that TN control will not achieve its intended purpose. The Upper Piscataqua has a lower transparency level than Great Bay, but also lower chlorophyll *a* levels, verifying that other factors are controlling transparency in this system. In fact, the difference in median chlorophyll *a* in all of these areas is negligible (1-3 ug/l). This difference in chlorophyll *a* could not physically account for the wide range of light attenuation occurring in the various areas (K_d = 0.5-2.3 m^{-1}). 5- 67

Throughout the late 1990s as eelgrass declined, chlorophyll *a* levels remained constant, even though data confirm that TIN levels increased by 40%. These data confirm that chlorophyll *a* growth in the system is not significantly responding to increase inorganic nitrogen levels (the component of nitrogen that supports plant growth). Likewise, data from the tidal rivers do not show any significant relationship between algal levels and minimum DO occurrence. The assumption that nitrogen levels and excessive phytoplankton growth in the system is causing widespread impairment is simply not justified based on the available data. *See, e.g.*, Exs. 2, 3, and 4 – Transparency-phytoplankton relationship charts for the Squamscott, Lamprey, and Piscataqua Rivers. 5- 68

The Memorandum of Agreement between the Coalition and DES recognizes that use impairments exist in the Bay, but the causes of such impairments are still under investigation. (Ex. 13.) The MOA concurs that the impact of nitrogen on eelgrass losses, via transparency, is uncertain and requires further peer review assessment. (*See* MOA Coalition Provision V and Whereas provisions.) Due to these uncertainties, DES, the document author, has stated that the draft criteria should <u>not</u> be used for NPDES derivation purposes until the subsequent peer review confirms that the criteria are necessary and appropriate. (*See* Ex. 13 – MOA, Provision Mutual Agreement II and III.) DES has explicitly acknowledged that it needs to propose the draft criterion for adoption and has not yet done so in light of the admitted technical uncertainties. (*See* Ex. 13, MOA – DES Agreement II; *see also* 40 C.F.R. § 131.20.) This applies to both narrative and numeric criteria interpretations. In addition, the review procedure established under the MOA has indicated that transparency was not the cause of eelgrass decline in either the Bay or tidal rivers. The following briefly summarizes the results of the MOA Review Committee and the updated information from various water quality assessments (e.g., Squamscott River sampling program). 5- 69

Two meetings were held with a group of UNH researchers, DES, Coalition members, and Coalition members' consultants. The UNH participants were selected because of their specific expertise on key ecological issues of concern. Many of these participants are also members of the PREP review committee. The meeting minutes from those discussions are attached. (*See* Exs. 14 and 15 – MOA Meeting Minutes.) Based upon those discussions, the following technical conclusions have been drawn: 5- 70

a. Eelgrass losses in the portions of Great Bay and tidal rivers where nitrogen levels are elevated do not appear to be a result of either insufficient transparency or excessive epiphyte growth; eelgrass receive sufficient light over the tidal cycle (confirmed by Fred Short); 5- 71

b. Macroalgae growth has significantly increased in the Great Bay over the past two decades, and this condition is adversely impacting habitat and eelgrass populations (confirmed by Art Mathieson) (Note: Such excessive macroalgae growth has not been documented in any of the Bay's tidal rivers or tied to any decline in eelgrasses in those areas.); 5- 72

c. Macroalgae die back every winter, and their regrowth occurs primarily during warmer weather, peak light months (May to September) (confirmed by Art Mathieson); **5- 73**

d. The excessive macroalgae are most likely caused by increased dissolved inorganic nitrogen (DIN) loads to the Great Bay though certain invasive species may also tolerate low DIN levels (confirmed by Art Mathieson, DES); and **5- 74**

e. The level of DIN control required to control macroalgae is not known with any certainty, but these invasive species should be controllable through reduction of inorganic nitrogen loading levels to mid-1990 conditions when the eelgrass resource experienced a period of abundance (confirmed by group discussion). **5- 75**

In addition, Dr. Fred Short acknowledged that the primary issue in Great Bay is macroalgae and that he did not know why the eelgrass population in Little Bay failed to recover. (*See* Ex. 16 -EPA Phone Logs of Conversations with F. Short dated Nov. 14 & 18, 2011.) **5- 76**

Based upon this information, the 2009 proposed draft TN criteria are plainly in error and should be amended, as well as the draft 2012 Section 303(d) list in which NHDES posited that decreases in the eelgrass resource was caused by elevated nitrogen levels and reductions in transparency. It is now clear that the draft criteria's assumption that transparency, chlorophyll *a* levels, and TN were the causal factors for eelgrass losses in both tidal rivers and the Bay was incorrect. All of the water quality standards ("WQS") development documents based on that paradigm are equally in error and misdirected. The focus for the Bay restoration should be changed to macroalgae and DIN. **5- 77**

4. Transparency Levels Claimed Necessary to Protect Great Bay Have Been Admitted as Unnecessary by Dr. Short, Given Tidal Variation and Light Availability During Low Tide in Great Bay

DES' analyses provide no demonstration that eelgrass losses in the Bay are, in fact, correlated to reduced transparency. If they were, eelgrass losses from the deeper Bay waters would be the most prevalent – they are not. (*See* Ex. 17, Figure 5, presentation of Fred Short, Impediments to Eelgrass Restoration.) In recent months, Professor Fred Short has repeatedly acknowledged that the large tidal fluctuation in Great Bay allows the eelgrass to receive sufficient light and that, therefore, transparency is not likely a controlling factor in this area. (*See* Exs. 14 and 15 – MOA Meeting minutes; Ex. 16 – EPA Phone Logs of Conversations with F. Short dated Nov. 14 & 18, 2011.) In contrast to the transparency theory of eelgrass loss, higher losses appear to have occurred in shallower environments where the most light is available, and eelgrass are healthiest in the deeper waters. (*See* Figure HAB2-2, 2009 PREP Report.) This <u>could</u> evidence that macroalgae or shoreline development is adversely impacting eelgrass populations. In addition, during the period in which eelgrass in Great Bay were faring well, the light attenuation in Great Bay was approximately 1.0 m^{-1} – not 0.75 m^{-1}. There is no reason to believe a number lower than 1.0 m^{-1} would be necessary given the tidal variation in the Great Bay's physical setting. Therefore, the assumed connection between eelgrass loss and algal-induced transparency decrease was in error. **5- 78**

5. The Cause of Eelgrass Decline in Little Bay and the Tidal Rivers Remains Unknown

The cause of eelgrass decline in Little Bay and the tidal rivers remains unknown. The available data on eelgrass distribution in the Great Bay Estuary confirms that losses of eelgrass were attributed to multiple episodes of wasting disease in 1931-1932, 1984, 1988-1989, and 1995. (2008 CWA 303(d) Listing Methodology and Assessment at 8 – 9.) The loss of eelgrass in the Piscataqua River has been attributed to the 1984 wasting disease outbreak. (2008 303(d) Listing Methodology and Assessment at 13.) Recovery from such outbreaks can take up to 50 years. (*See* 2008 303(d) Listing Methodology and Assessment at 9 – 10.) The 2009 PREP report confirmed the cause of the loss was "unknown." Therefore, the assertion that reduced transparency, caused by excessive nitrogen concentration, is the reason for eelgrass loss and the key to its restoration in these tidal rivers and elsewhere in the Estuary is entirely misplaced. **5- 79**

Tidal rivers (the rivers tributary to Great Bay, minus the Piscataqua River) – Even in the absence of nitrogen, no eelgrass could grow in the tidal rivers because the turbidity and color is too high and thus transparency is too poor, naturally. Low transparency in the tidal rivers that is preventing the return of eelgrass in areas it previously existed is not the result of the rivers' nitrogen loads. These are natural conditions, and state law does not allow classifying any natural conditions as impairments. All eelgrass impairments for the Lamprey River, Squamscott River, and Upper Piscataqua River should be eliminated due to natural conditions. **5- 80**

Little Bay – Little Bay eelgrass cover did not rebound even when Great Bay eelgrass cover did after the last major instance of wasting disease, not even in shallow areas where transparency was more than sufficient. The reason Little Bay's eelgrass population did not recover is unknown. Dr. Fred Short acknowledged that he does not know why the eelgrass population in Little Bay failed to recover. (*See* Ex. 16 - EPA Phone Logs of Conversations with F. Short dated Nov. 14 & 18, 2011.) **5- 81**

Piscataqua River –Eelgrass cover was increasing in the Piscataqua River in the early 2000's, but exhibited declines from 2005 – 2010. This period of decline coincides with a period of changing rainfall pattern (increased rainfall from 2005 – 2010). Elevated river flow during the eelgrass' primary growing season caused increased color load (and possibly increased turbidity) in the Piscataqua River sufficient to reduce water clarity. Over this period there was no increased in phytoplankton. The cause of the eelgrass loss in the Piscataqua River is not known. It could very well have been reduced transparency. However, there is no scientific evidence linking eelgrass loss to TN levels or phytoplankton chlorophyll-a. **5- 82**

Bellamy River – The Bellamy River has no WWTP discharges and the highest water quality, but has lost as much eelgrass as rivers with WWTP discharges. **5- 83**

6. DES' 303(d) List Chl 'a'/DO-based Criteria Are Methodologically Flawed and Incorrect

DES' draft 2012 Section 303(d) listing of DO impairments based on Chl a and nitrogen levels is methodologically flawed and must be removed from the 303(d) list. In accordance with the Memorandum of Agreement (MOA) between the Department and the Coalition, a detailed study of the Squamscott River was initiated to evaluate these assumed relationships. As demonstrated by the detailed monitoring and analysis conducted by HydroQual, with assistance from the Jackson Marine Laboratory, the DO regime of the Squamscott River is far more complicated than originally determined by the Department in its 2009 Numeric Nutrient Criteria for Great Bay (2009 Criteria Report). This new information confirms that periodic low DO and elevated algal growth does occur, but not as a direct result of elevated TN levels as originally assumed in the 2009 Criteria Report. **5- 84** The low DO occurs when algal levels *decrease* and therefore less oxygen is pumped into the system from photosynthesis. High algal levels occur primarily as a result of greatly elevated algal levels discharged from the City of Exeter lagoon system. This external algal input skewed the dataset for this river system (in comparison to other tidal areas within the Great Bay system). This artifact, unique to the Squamscott River, made it wholly inappropriate for that data to be plotted along with data from other tidal areas of the bay to predict DO changes due to changing algal growth. Therefore, the Department's prior conclusions that (1) instream TN levels causing increased algal growth was the direct cause of periodic low DO readings in the river and (2) reducing algal levels and TN will achieve the 5 mg/l DO criteria was misplaced. Thus, this Squamscott River study confirms that the 2009 Criteria Report needs to be updated to be scientifically defensible, and DES may not base Section 303(d) impairments on DES' flawed assumptions and inapplicable criteria.

a) Squamscott River study confirmed that elevated Chl 'a' was not an indicator of poor DO conditions

The DO-based algal target has been demonstrated to not be an appropriate indicator on the Squamscott and Lamprey Rivers. **5- 85** The analysis of the diurnal data shows that it is caused by tidal variation and only a very minor component is attributable to the algal growth present in the tidal river. (Ex. 18, Diurnal DO Variation Analysis for Squamscott River developed by DES.) On average, the total algal induced variation is less than 1 mg/l (i.e., less than 10% variation in DO saturation). The total impact on minimum DO from algal growth is estimated at less than 0.4 mg/l – a negligible amount that cannot be significantly reduced. More detailed studies of the Squamscott River confirmed that low DO conditions were not apparently related to algal growth (Jones et al., *Impacts of Wastewater Treatment Facilities on Receiving Water Quality* (April 2007) (NH Estuary Project Report) @ 3: "The nutrient and chlorophyll a levels at the different sampling sites in the Squamscott River did not appear to have an discernable relationship to DO levels."). Likewise, analysis of data for the Lamprey River showed that low DO's occurred where low algal growth existed due to the system hydrodynamics and stratification. (*See* Pennock (2005), cited in *Numeric Nutrient Criteria for Great Bay – draft* (NHDES 2009) at 51 (hereafter 2009 DES Report)). None of the river-specific data indicated a significant relationship between minimum DO and algal growth, confirming that (1) preliminary impairment causes of low DO were not well supported, and (2) the system wide analysis used by DES to generate the DO-based TN numeric criteria provided misleading results.

In addition, it should be noted that the more recent assessments indicate that low DO conditions in the tidal rivers occurred less frequently from 2005-2008 than occurred earlier in the decade. (*See* 2009 PREP Estuaries Report NUT 5-1 to 5-5.) Thus, the DO data demonstrate that there is not a direct connection between low DO and TN levels, as the *higher* TN levels and loadings have produced the *better* DO conditions. Clearly, DES' misplaced generalizations regarding trend data and the influence of TN on transparency and DO conditions in the estuary do not provide a scientifically defensible basis for listing the tidal rivers as impaired.

7. Impairment Listings May Not Be Based on Underlying Natural Causes

Violations of the narrative standard may not be determined based on the absence of eelgrass if the absence is due to underlying natural causes. Furthermore, violations of the narrative standard may not be determined when an underlying natural cause prevents the restoration of eelgrass populations. Transparency in the Squamscott, Lamprey, and Piscataqua Rivers, as well as other tidal rivers, is CDOM-controlled and clearly insufficient due to underlying natural causes. (*See* Ex. 8.) Turbulence due to tidal exchange also causes high turbidity in these systems, as demonstrated by the DES turbidity data contained in Ex. 7. Because the conditions producing poor water quality are natural, these conditions may not constitute a violation of the State's narrative water quality standards, and a TN-based transparency standard to protect eelgrass growth is not germane to this area. As such, the claim that eelgrass uses exist in the Squamscott, Lamprey, and Upper Piscataqua Rivers is not reasonable or supported by the available information, and the presumption that TN control will produce improved transparency levels in the Piscataqua River sufficient to allow eelgrass growth is unfounded. Rather, due to these natural conditions, restoration is not possible in these areas of the Estuary. Furthermore, even if those parts of the Estuary were considered to be eelgrass habitat, the restoration of eelgrass populations are not being prevented by increased nitrogen. (*See* Ex. 19 – Presentation of P. Trowbridge – "Nutrient Criteria Development for the Protection of Eelgrass in NH's Estuaries" dated Mar. 25, 2008, at Slide No. 22 (stating (1) turbidity and CDOM account for 61% of light attenuation in Great Bay versus 8% for Chlorophyll *a*).) **5- 86**

8. The Use of Biomass to Determine Eelgrass Impairment is Unreliable **5- 87**

The use of biomass in the determination of eelgrass impairments is presently unreliable and may not be used. (*See* Ex. 20 – F. Short email confirming inability to assess level of reliability of biomass data.) DES itself noted the use of biomass at present is unreliable as follows:

> DES, with input from the Piscataqua Region Estuaries Partnership (PREP) Technical Advisory Committee, spent considerable time researching the appropriate indicators for eelgrass habitat and concluded that eelgrass biomass data had too much uncertainty and insufficient quality control/quality assurance procedures to be used for regulatory purposes (DES, 2008). In order for data to be used for assessment purposes, EPA recommends, and DES requires (DES, 2010b), adequate metadata, documented procedures, and documented quality control/quality assurance. Therefore, for impairment determinations and nutrient criteria development, DES has used eelgrass cover as the indicator.

(Methodology and Assessment Results related to Eelgrass and Nitrogen in the Great Bay Estuary for Compliance with Water Quality Standards for the New Hampshire 2008 Section 303(d) List. NH DES. Aug. 11, 2008.) As such, the use of biomass in the Technical Support Document to Draft 2012 NH 303(d) List's Fig. 3 must be deleted. Biomass may not be used until its level of reliability can be confirmed.

III. REQUESTED CHANGES TO 303(d) LIST OF IMPAIRMENTS

The following 303(d) impairment listings must be amended as follows:

A. DES Must Remove N-based and Chl *a*-based DO Violations from Water Bodies in which there is No DO Data Showing Violation of Numeric DO Criteria

5- 88

As discussed above, DES may not simply ignore data showing numeric criteria compliance (DO) in tidal rivers based on an assumed DO/chl 'a' relationship, as this would constitute an illegal use of surrogate criteria. Despite this, DES has listed a number of water bodies as DO-impaired without data showing that the water body is in violation of numeric DO criteria. The draft 2012 NH 303(d) list must be amended to remove all such impairments, including those as follows:

1. Cocheco River

The Cocheco River is listed on the draft 2012 303(d) list as impaired for DO based upon observed concentrations of Chl *a* and TN even though numerous observations for DO show that the criterion is not exceeded. (No exceedance of the minimum DO criterion in 55 observations; no exceedance of DO saturation limits in 44 observations). In fact, the 1997 Rochester NPDES Permit Fact Sheet stated the following:

5- 89

> "Draft permit limits [for CBOD and total ammonia] developed from this model are sufficient to protect Class B NH Standards for DO in the receiving water after mixing with the effluent. That is, the combined effect of CBOD5 and Total Ammonia limits, on an average monthly basis, will not cause the DO in the Cocheco River to be less than a daily average of 75 percent of saturation, or, on a maximum daily basis, will not cause the DO to be less than an instantaneous minimum of at least 5.0 mg/L."

(1997 EPA NPDES Permit Fact Sheet for Rochester at 8.) DES based the Cocheco River's impairment designation on an assumption, rather than data showing a numeric DO water quality violation. As such, this impairment designation must be removed.

B. DES Must Remove Water Bodies from the List that Are No Longer Impaired

1. Great Bay

DES must remove Section 303(d) impairment listings for water bodies that are no longer impaired. Great Bay currently meets the acreage requirement for non-impaired status based on the 2010 eelgrass report (e.g., 2,100 acres ± 20%). In 2010, eelgrass cover in Great Bay was 1,722.2 acres (*See*, New Hampshire's 2012 Section 305(b)/303(d) List Technical Support Document Assessment of Aquatic Life Use Support in the Great Bay Estuary for Chlorophyll-a, Dissolved Oxygen, Water Clarity, Eelgrass Habitat, and Nitrogen (April 20, 2012; hereafter, the "TSD") Table 3 at 14). Moreover, since eelgrass cover declined in 2005 (presumably in response to increased rainfall patterns), the eelgrass cover has trended upwards. As such, this impairment designation is in error, and DES must remove this impairment designation. **5- 90**

C. Decreased Transparency Related to Natural Causes Must Be Noted as Natural in Origin and Must Not Be Considered an Impairment and Thus a Violation of the Narrative Criteria

1. Transparency Must Be Eliminated as a Cause of Impairment in the Squamscott, Lamprey, and Upper Piscataqua Rivers

Exceedances of water quality criteria due to naturally occurring conditions are not considered violations of State water quality standards. (*See*, 2012 Section 305(b) and 303(d) Consolidated Assessment and Listing Methodology (April 2012; hereafter, the "CALM") at 12). As discussed in Section 7, *above*, transparency in the Squamscott, Lamprey, and Piscataqua Rivers, as well as other tidal rivers, is CDOM-controlled and due to underlying natural causes. (*See* Ex. 8.) Turbulence due to tidal exchange also causes high turbidity in these systems, as demonstrated by the DES turbidity data contained in Ex. 7. Because the conditions producing poor water quality are natural (and not due to nitrogen levels), these conditions may not constitute a violation of the State's narrative water quality standards, and a TN-based transparency standard to protect eelgrass growth is not appropriate in these areas. Consequently, low transparency in these tidal rivers must be eliminated as a cause of impairment in the draft NH 2012 Section 303(d) List. **5- 91**

2. The Designation of Eelgrass Loss as an Impairment in the Squamscott, Lamprey, and Upper Piscataqua Rivers Must Be Eliminated

As discussed in Section 7, *above*, the absence of eelgrass in these tidal rivers appears to be the result of a natural condition caused by elevated levels of color and turbidity, which preclude use of these waters as eelgrass habitat. Violations of the narrative standard may not be determined based on the absence of eelgrass if the absence is due to such underlying natural causes. Furthermore, violations of the narrative standard may not be determined when an underlying natural cause prevents the restoration of eelgrass populations, and a TN-based transparency standard to protect eelgrass growth is not germane to this area. As such, the claim that eelgrass uses exist in the Squamscott, Lamprey, and Upper Piscataqua Rivers is not reasonable or supported by the available information, and the presumption that TN control will produce improved transparency levels in the Piscataqua River sufficient to allow eelgrass growth is unfounded. Rather, due to these natural conditions, restoration is not possible in these areas of the Estuary. Furthermore, even if those parts of the Estuary were considered to be eelgrass habitat, the restoration of eelgrass populations are not being prevented by increased nitrogen. (*See* Ex. 19 – Presentation of P. Trowbridge – "Nutrient Criteria Development for the Protection of Eelgrass in NH's Estuaries" dated Mar. 25, 2008, at Slide No. 22 (stating (1) turbidity and CDOM account for 61% of light attenuation in Great Bay versus 8% for Chlorophyll *a*).) **5- 92**

D. Transparency Must Be Eliminated as a Cause of Impairment Where the Cause of Eelgrass Loss is Unknown

1. Little Bay

As discussed in Section 5, above, Little Bay eelgrass populations did not rebound even when Great Bay did after the last major instance of wasting disease, not even in shallow areas where transparency was more than sufficient. The reason Little Bay's eelgrass population did not recover remains unknown. Dr. Fred Short acknowledged that he does not know why the eelgrass population in Little Bay failed to recover. (*See* Ex. 16 - EPA Phone Logs of Conversations with F. Short dated Nov. 14 & 18, 2011.) Moreover, eelgrass cover data for 2011 indicates that eelgrass cover in Little Bay exceeds historical levels, suggesting that Little Bay is not impaired for eelgrass cover. **5- 93**

E. Chlorophyll-a and TN Must Be Eliminated as Causes of DO Impairment Where the Cause of Impairment is Due to Natural Conditions

1. Tidal Rivers (Squamscott, Lamprey)

5- 94

As discussed in Section 6, above, DO variation and criteria exceedances have been attributed to system hydrodynamics and stratification. (See, Ex. 18 – Diurnal DO Variation Analysis for Squamscott River developed by DES, and report by Pennock (2005).) As DES has been unable to show that Chlorophyll-a or TN cause the observed DO concentrations in these tidal rivers, the draft 2012 303(d) listings must be revised to exclude chlorophyll-a and TN as causes for impairment.

COMMENT # 6: Dean Peschel, Great Bay Municipal Coalition

From: Dean Peschel [dean_peschel@yahoo.com]
Sent: Thursday, October 18, 2012 7:29 AM
To: Suzanne M. Woodland; Jennifer Perry; Dana Bisbee; Peter Rice; John Hall; 303d Comment; Terry Desmarais; Tom Gallagher; ekinder; Drew Serell; Bill Hall; Robert R. Lucic; John Peltonen; Sean Greig; Dave Green
Subject: Fw: Nitrogen Article from UNH Researcher
FYI

Dean Peschel

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----- Forwarded Message -----
From: "Joyal, Michael" <M.Joyal@dover.nh.gov>
To: "Dean Peschel (dean_peschel@yahoo.com)" <dean_peschel@yahoo.com>
Cc: "Steele, Doug" <D.Steele@dover.nh.gov>
Sent: Thursday, October 18, 2012 12:34 AM
Subject: Nitrogen Article from UNH Researcher

This was published in a UNH newsletter this week... **6- 1**

http://www.unh.edu/campusjournal/2012/10/excess-nutrients-collapsing-east-coast-salt-marshes-scientists-show

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COMMENT # 7: Dean Peschel, Great Bay Municipal Coalition

GREAT BAY MUNICIPAL COALITION

November 2, 2012

<u>Via Email</u>
Mr. Ted Diers, Administrator
Watershed Management Bureau
Mr. Philip Trowbridge
New Hampshire Department of Environmental Services
29 Hazen Drive, PO Box 95
Concord, NH 03301 7- 1

RE: Need to Substantively Amend the April 20, 2012 CALM Response to Comments and Proposed 2012 Section 303(d) List

Dear Messrs. Diers and Trowbridge:

Last year the Great Bay Municipal Coalition submitted comments on the 2012 CALM and related draft Section 303(d) impairment listings. During the deposition process, Mr. Trowbridge provided a copy of the Department of Environmental Service's (DES) responses to the impairment listings issues raised by the Coalition and other parties. At that time, the Coalition's counsel had the opportunity to explore a number of the responses and the underlying scientific record that DES was asserting was sufficient to declare Great Bay and various tributaries nitrogen impaired. Based on those responses, it is apparent that the regulatory responses contained in the April 20, 2012 document are seriously flawed and not consistent with the burden of proof required to classify specific waters as violating the existing narrative criteria for aquatic integrity or nutrients.

As DES well knows, the declaration of estuary waters as nutrient impaired triggers a number of significant legal and regulatory requirements; therefore, such actions must be based on an adequate scientific record. As acknowledged in a recent letter from Commissioner Burack responding to the Coalition's request for an update scientific peer review, DES admitted nitrogen impacts on water column transparency is not a major issue in Great Bay or the tidal rivers, as follows: 7- 2

- Algal levels in the system [the Great Bay Estuary] did not change materially from 1980 to present, despite an increase in TN levels between 1980 and 2008.

- Transparency in the major tidal rivers (Squamscott, Lamprey, Upper Piscataqua) is poor, but the available data (not previously analyzed by DES) show that (a) the effect of algal growth on transparency is negligible, (b) naturally occurring CDOM and turbidity are the key factors controlling transparency in the system. 7- 3

- Great Bay itself is generally not a water column transparency limited system because eelgrasses receive sufficient light during the tidal cycle. 7- 4

- The various DES/PREP analyses that evaluated whether (a) TN increases had caused changes in transparency, algal levels or DO and (b) a "cause and effect" relationship between TN and transparency/DO existed, were excluded from the technical information presented in the 2009 numeric nutrient criteria document and, therefore, were never presented to EPA's peer review panel. **7- 5**

- Dissolved nutrient concentrations (which directly effect macroalgae growth) have now returned to 1970-1980 levels. This dramatic change in ambient DIN levels appears to be the result of reduced rainfall. **7- 6**

Given these acknowledgements by Commissioner Burack, it is erroneous for DES to rely upon the water column-based transparency criteria in developing the proposed Section 303(d) list since water column transparency is no longer a scientifically credible justification for the alleged nitrogen impairment in the Great Bay Estuary. Therefore, we request that DES withdraw that April 2012 response, the proposed 303(d) list and re-issue a new document that reflects the sworn testimony and available scientific information. **7- 7**

The attachment identifies the important scientific and regulatory conclusions were acknowledged during the depositions.[1] These statements confirm that it is inappropriate to assert that nitrogen has been demonstrated to be the cause of changing eelgrass populations due to reduced transparency in the system or other factors. Moreover, the assertions in the CALM response that macroalgae and direct nitrogen toxicity have also been demonstrated to be the cause of eelgrass losses by a "weight of evidence" analysis is equally untenable. The level of inorganic nitrogen was well above the alleged "protective" nitrate concentration (0.15 mg/l – long term average) for years when eelgrass was considered unimpaired in this system (early 1990s- 2005). Regarding alleged macroalgae impacts, eelgrass populations have increased significantly since 2006 despite the presence of macroalgae and epiphytes. In particular eelgrass populations continue to increase in Little Bay and in 2011 exceeded "target" levels present in 1996. We further understand that the 2012 eelgrass mapping has confirmed that an even greater expansion of eelgrass beds has occurred in Little Bay. Plainly, neither water quality or epiphytic/macrophyte growth is preventing eelgrass reestablishment in this system. Continuing to assert that existing nutrient conditions are inimical to eelgrass regrowth is not a tenable or factually defensible position. **7- 8**

With regard to DES's latest assertion that nitrogen has triggered widespread macroalgae growth, the "facts" again do not support that position. The Nettleton document now referenced by DES as the basis for concern does not show that macroalgae growth was a result of changing nutrient

[1] Copies of the deposition transcripts and exhibits are already in DES's possession and therefore, in an effort to avoid duplication, such information is not being resubmitted with this letter.

2

levels nor does it provide evidence that macroalgae growth today constitutes an impairment in the estuary. The depositions confirmed that additional research would be necessary to establish those causal connections. Dr. Short, through as late as 2007 stated macroalgae were not a major factor impacting eelgrass populations. The depositions confirmed that there is no evidence showing that macroalgae populations are, in any way, significantly preventing the regrowth of eelgrass in this system. Mr. Trowbridge testified that the ecological significance of such growth was, as yet, unknown. Moreover, recent physical evidence (pictures of sites addressed by Nettleton in 2008) shows far less macroalgae growth in the same locations in the fall of 2012. (Attachments) Why this change has occurred is unknown but certainly underscores that the 2009 Nettleton report cannot be used as evidence nitrogen has caused dramatic changes in macroalgae. Such growth is plainly ephemeral, changes year to year and its significance needs to be studied further. **7- 9**

Based on the testimony and available scientific information, we again request that the following changes to the proposed 2012 Section 303(d) impairment listing:

1. Delete the nitrogen impairment designations related to both eelgrass and DO for all assessment units – the available studies conducted for this system confirm that this parameter does not have a demonstrated causal connection to either low DO or eelgrass conditions. Changes in nitrogen did not cause significant changes in algal growth anywhere in this system. **7- 10**

2. Identify the lack of eelgrass in various tidal rivers (Lamprey, Squamscott and Upper Piscataqua) as presently limited by natural conditions. **7- 11**

3. Where eelgrass population decreases are identified, the cause of impairment should be listed as "unknown." **7- 12**

4. Delete the transparency impairment listings for the entire system as it is either not a liming factor (Great Bay) or controlled by natural conditions (tidal rivers). **7- 13**

5. Identify macroalgae growth as a "threatened" impairment with an unknown ecological impact and unknown cause. **7- 14**

GREAT BAY MUNICIPAL COALITION

Thank you for your consideration of this information that was developed after the completion of the DES Response to Comments. **7- 15**

Sincerely,

Dean Peschel for
The Great Bay Municipal Coalition

Attachments

cc. Coalition Members

Attachment

Compilation of Important Scientific and Regulatory Findings from the Depositions of Mr. Paul Currier and Mr. Philip Trowbridge **7- 16**

1. The numeric TN criteria for eelgrass and DO were not based on a demonstrated "cause and effect" relationship. ((See, Currier Dep. at 77, 80, 147; Trowbridge Dep. at 413-416, 445-446; Short Dep. at 173-175); Exh. 88 – Email from Trowbridge (DES) to Latimer (EPA) November 19, 2008)	
2. Algal levels in the system did not change materially from 1980 to present, despite a 59% increase in TIN levels and therefore TN inputs could not have caused changed transparency in the system. (PREP 2012 Nutrient and Algal Charts for Adams Point and Trowbridge Dep. 121-127); see also "State of the Estuary Reports 2000-2006 and draft 2013 Report)	**7- 17**
3. The best available information shows that transparency in Great Bay and Lower Piscataqua River did not change materially from 1990 to 2005; therefore this parameter could not be the factor causing eelgrass declines found in the system prior to that time as assumed in the draft 2009 Numeric Criteria. (See, Dep. Exh., 31, 32, 71 and 72; Trowbridge Dep. at 230).	**7- 18**
4. Transparency in the major tidal rivers (Squamscott, Lamprey, Upper Piscataqua) is poor, but the available data, (not previously analyzed by DES) shows that (1) the effect of algal growth on transparency is negligible (2) CDOM and turbidity are the key naturally occurring factors controlling transparency in the system and (3) regulating TN in the tidal rivers will not result in any demonstrable improvement in transparency. (Trowbridge Dep. at 409-10, 421-428, 431-434; Exh., 20-22 showing transparency versus chlorophyll *a* level for the Squamscott, Lamprey and Upper Piscataqua Rivers)	**7- 19**
5. CDOM, a naturally occurring condition, has the greatest influence on light transmission throughout the system. (Trowbridge Dep. at 427-431) Color originates from the watersheds of the tidal rivers. Id.	**7- 20**
6. Great Bay is not a transparency limited system because eelgrass populations receive sufficient light during the tidal cycle. (Trowbridge Dep. at 177, 211-212, 360-361 as discussed in numerous emails between DES, EPA and Dr. Short)	**7- 21**
7. A large increase in rainfall and major floods occurring from 2006-2008 (a natural condition) could be the primary cause of dramatic eelgrass declines that occurred in Great Bay during that period. DES failed to assess the importance of these events in triggering the eelgrass decline in the system. (Trowbridge Dep. at 381-384, 436)	**7- 22**
8. Available historical data and recent eelgrass regrowth in the system indicate that the transparency level chosen to establish the draft 2009 nutrient criteria is not necessary to support healthy eelgrass growth in Great Bay, Little Bay and Lower Piscataqua River. (Currier Dep. at 69; Trowbridge Dep. at 182-183 240-241, 356).	**7- 23**
9. No site-specific research has been completed to evaluate the cause of eelgrass declines anywhere in the Great Bay system. To date, the causes of such eelgrass declines remain unknown. (Trowbridge Dep. at 82-83, 370-372, 120-125, 135-136, 149-150, 152, 408; Short Dep. at 16, 20-25)	**7- 24**
10. The various DES analyses that confirmed (1) TN increases did not cause changes in transparency, algal levels or DO and (2) a "cause and effect" relationship between TN and transparency/DO did not exist, were excluded from the technical information presented in the 2009 Numeric Nutrient Criteria support document and, therefore, were never presented to EPA's internal peer review panel. (Trowbridge Dep. at 436-440)	**7- 25**
11. Periodic low DO occurring in the tidal rivers is not well correlated to elevated algal levels (Trowbridge Dep. at 31-32).	**7- 26**

12. In the past 4 years, macroalgae growth has begun to increase in the intertidal areas (mud flats exposed at low tide) but eelgrass population regrowth, occurring in deeper waters, does not appear to be materially impacted (Exh. 58; Trowbridge Dep. at 104-105, 156-157, 240-241). **7- 27**

13. Macroalgae are not identified as an ecological problem in any of the tidal rivers. (Trowbridge Dep. 380-381) **7- 28**

14. Narrative criteria violations require a documented causal relationship between nutrients and excessive plant growth adversely impacting designated uses (Currier Dep. at 18, 19, 134). Both Mr. Trowbridge and Mr. Currier confirmed that the 2009 Criteria is not based on a demonstrated causal relationship and exceeding values contained in the 2009 Criteria does not demonstrate that a narrative violation exists. (Currier Dep. at 77, 80, 147; Trowbridge Dep. at 332-333, 413-416, 445-446; Short Dep. at 173-175) **7- 29**

15. Mr. Trowbridge indicated that his prior research and subsequent studies confirmed that nitrogen was not causing adverse water quality in Great Bay estuary. (See, Deposition Exh., 31, 32, 71 and 72; Trowbridge Dep. at 235- 236) In particular, the following "findings" resulted from these data assessments and analyses:

    - Nitrogen increased but algal levels did not change in the system. **7- 30**
    - Algal levels are a minor component influencing system transparency; turbidity and color are the most important factors;
    - There is no indication that transparency changed from 1990 through 2007 during the period of nutrient concentration increases.

16. Mr. Trowbridge presented EPA with PowerPoint review of his various analyses confirming no TN-algal-transparency connection existed for the Great Bay estuary in March 2008. (Exh. 72) The database presented by Mr. Trowbridge to EPA in March 2008 confirmed that the average Kd for Great Bay was above 1.0 and TN above 0.42 mg/l prior to 2006 when eelgrass were considered healthy. Mr. Trowbridge acknowledged the assessment presented was the only available information. (Trowbridge Dep. at 230) **7- 31**

17. Cultural eutrophication (i.e., documented negative impacts on uses due to excessive nutrient inputs), did not occur in Great Bay or the Piscataqua River up to 2007 (Trowbridge Dep. At 326-328, 355-356, 433-434 and Currier 62-63, 69). Moreover, the 2007 transparency study completed by Morrison (Trowbridge, co-author) for Great Bay, concluded transparency was sufficient to support eelgrass in Great Bay and Little Bay and therefore other factors must be limiting eelgrass populations in the system. (Trowbridge Dep. at 235- 236, 360-361). **7- 32**

18. Mr. Currier acknowledged that the mere historical presence of eelgrass in an area, is not a sufficient basis to regulate nutrients. (Currier Dep. at 130-131). He further noted that it would be improper to apply the 2009 Numeric Nutrient Criteria to protect eelgrass if the data confirmed other factors were limiting eelgrass propagation. Id at 136-137. **7- 33**

19. Based on a review of the very data submitted by the Coalition in its permit comments (Short Dep. Exh.20, 21,and 22), Mr. Trowbridge acknowledged that transparency is too poor in the major tidal rivers (Squamscott, Lamprey, Upper Piscataqua) to support eelgrass growth, due to the amount of color and turbidity present. (Trowbridge Dep. at 409-10, 421-428, 431-434). These are *precisely* the type of data and finding that Mr. Currier stated would obviate the need to achieve the recommendations contained in the 2009 Numeric Nutrient Criteria document. **7- 34**

20. The Section 303(d) listing record confirmed that the post-2005 dramatic eelgrass decreases in Great Bay and Lower Piscataqua River and litigation threats by CLF were the driving factors for claiming Great Bay was impaired and TN was the cause. (Currier Dep. at 78-79, 97 and Exh. 34 - internal DES email stating EPA requested the impairment listing change to avoid CLF suit). Prior to this time, neither area was considered impaired for eelgrass (See, Trowbridge Dep. at 356; Currier Dep. at 62-63, 69; Short Dep. at 120-125; see also, figures presented in Trowbridge March 2008 presentation to USEPA showing stable eelgrass acreage in both areas) . Nothing in the record at that time or since then, shows that nitrogen had anything to do with the dramatic eelgrass decline in 2006/2007. (Trowbridge Dep. at 370-372). **7- 35**

21. Mr. Currier indicated that conditions occurring prior to 2004 were sufficient to protect eelgrass resources (Currier Dep. at 69). Mr. Trowbridge also acknowledged the same position through 2005. (Trowbridge Dep. at 356) Mr. Trowbridge also acknowledged that the major regrowth of eelgrass also indicates that existing water quality supports healthy eelgrass propagation. (Trowbridge Dep. at 182-183 240-241) **7- 36**

22. Epiphytes have been raised as an issue of concern for Great Bay eelgrass. Epiphytes grow on the surface of the eelgrass and attenuate the light reaching the eelgrass. This can hinder eelgrass growth to varying degrees. However, Mr. Trowbridge agreed with Dr. Short's assertion that epiphytes pose negligible risk to Great Bay eelgrass populations (Trowbridge Dep. at 348-349). **7- 37**

23. Mr. Trowbridge did not oppose Dr. Short's findings that current macroalgae growth has not been demonstrated to prevent eelgrass restoration anywhere in Great Bay (Trowbridge Exh. 58; Trowbridge Dep. at 104-105). It should be noted further, that macroalgae in Great Bay, grow predominantly on tidal flats that do not support eelgrass. Regardless of macroalgae levels, eelgrass populations in Great Bay rebounded roughly 40% from 2007-2011 (Trowbridge Dep. at 156-157, 240-241). **7- 38**

24. The recent HydroQual report indicated that elevated algal levels exhibit no direct relationship with low DO (Trowbridge Dep. at 31-32). Prior State of the Estuary reports indicated that natural conditions may cause the low DO. Mr. Trowbridge acknowledged several natural conditions contribute to low DO in the tidal rivers, including tidal interchange, stratification, and sediment oxygen demand (Trowbridge Dep. at 39-46). Mr. Trowbridge also acknowledged that the relative impacts of algal growth versus all other factors influencing low DO have not been assessed. Id **7- 39**

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Attachment 1

Letter from Tom Burack, Commissioner of DES, to the mayors of Rochester, Dover, and Portsmouth. October 19, 2012.